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Improved Grain Hulling Machine.

This machine is claimed to do its work in a very superior manner, removing the exterior woody portion or bran of the grain, and leaving the nutritious portions, which are in some degree always wasted by the best milling in the ordinary way, so that the flour is enriched in quality upon subsequent grinding.

The attrition of the surfaces, by which the woody portions or hulls of the grain are removed, may be regulated with the utmost nicety; and the machine seems well adapted to the preparing of rice for market, as well as for the purpose already mentioned.

Its construction is very simple. Our engravings illustrate, first, the entire machine shown in perspective; second, a vertical section of a machine, with its internal or hulling cylinder made of stone, and the exterior of stone sections inclosed in a metallic case; and, lastly, a vertical section of a machine made wholly of metal. The principle of action is the same in both constructions. A hopper chute, A, Figs. 1 and 3, conveys the grain to the interior of the case, to be acted upon by the hulling cylinder, E, and the external grinding sections, F. The internal cylinder is grooved as shown, and the ribs thus formed enter between corresponding ribs formed in the exterior cylinder or shell.

It will be seen that raising or lowering the cylinder, E, will cause the upper surfaces of its ribs to approach or recede from the under surfaces of the ribs on the shell, by which the attrition upon the grain is regulated as required. This is accomplished by means of the adjusting lever, G, which supports the step of the cylinder, having a threaded rod pivoted to its outer end, upon which a nut turns, as shown.

The comminuted portions of the hulls are ejected through one or more screens, B, placed at suitable intervals over openings in the case and exterior grinding shell, the screens being boxed in so that the dust thus thrown out descends to the floor, upon which the machine rests, from which it is readily removed. The grain, when hulled escapes through the chute, C. Power is applied to the pulley, D, upon the vertical spindle of the cylinder, E.

The grooves on the internal cylinder extend outward and upward, so as to retain the grain and retard its passage through the machine.

By the method of hulling, introduced with this invention, the grain is treated with such a degree of nicety that only the particles not fit for flour—and none of the nutritious portions—will be removed. Experiments made by the inventor lead him to assert that from grain hulled in his machine 80 pounds of flour can be obtained, where but 70 pounds could be produced from a like quantity hulled in the ordinary way. But apart from the increase in weight, there is a further advantage gained by superiority in kind, as all the matter not applicable to good flour is entirely removed. Higher priced flour, and more of it, are therefore the inducements offered by the inventor to the enterprising millers who wish to adopt his huller. For the use of persons desiring to test the merits of the invention, the inventor has forwarded a complete hulling machine from Europe, which is now in the New York Custom House. Responsible parties may obtain the right to remove the same to their mills and use it for a limited term, free of charge, if they will have it put up, repacked, and returned after use, at their expense.

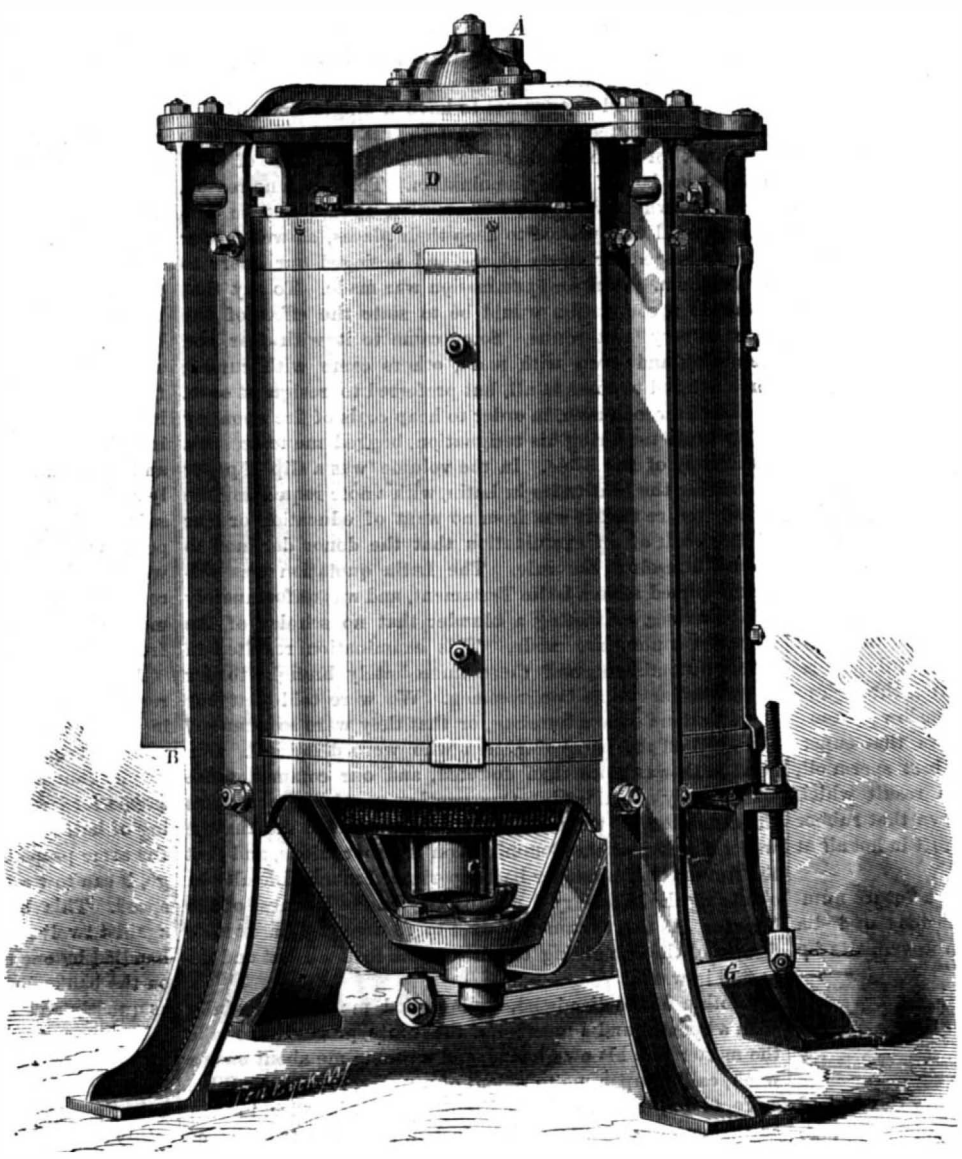


Fig. 2

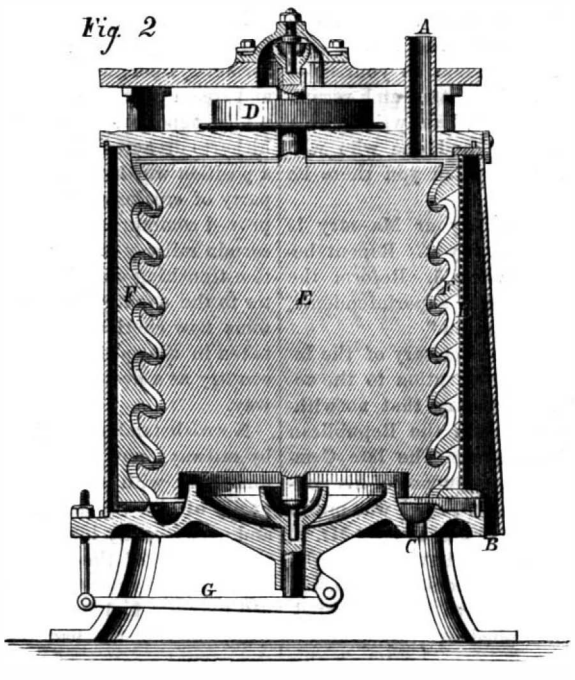
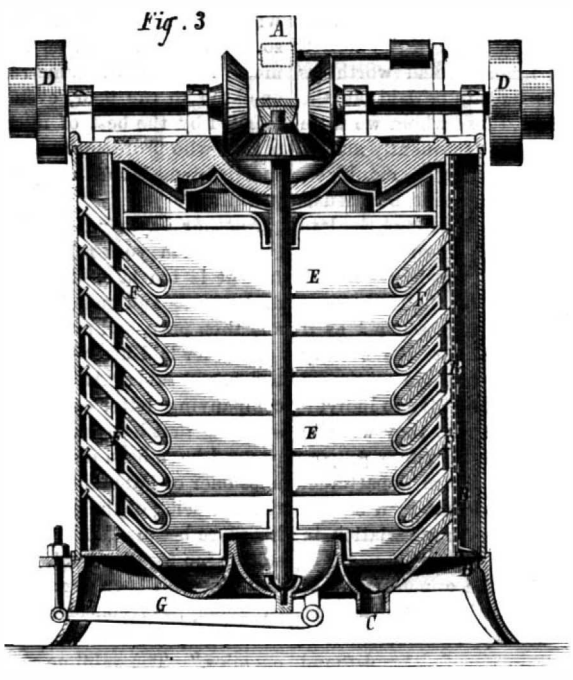


Fig. 3



HOFFMAN'S GRAIN HULLING MACHINE.

Patented through the Scientific American Patent Agency, April 18, 1871, by Michael Hoffman, of Munich, Germany. For further information address Louis Kölbl, Munich, or care Box 773, New York city.

Applications of Vulcanized Rubber.

The applications of vulcanized rubber are so numerous and so varied in their nature that we cannot perhaps do better than follow the selection of Mr. James Syme, Sen., in a paper read before the Institution of Engineers in Scotland, which is replete with practical information on the subject, but too long for the space at our disposal. In testing some specimens to ascertain the relation between breaking strain and price and density, Mr. Syme said he found the higher priced light qualities withstood less strain than the cheaper and denser, the utmost weight in direct strain borne on an area one quarter inch square being 85 lbs.; this was with rubber of 102¼ lbs. specific gravity to the cubic foot.

Probably one of the most important applications of vulcanized rubber is its use for the valves of marine engines. An opinion has been very general for some years that pure rubber valves of a floatable or nearly floatable quality were best for almost all purposes, but it is equally generally believed that good rubber is not readily to be obtained. Mr. Syme, however, thinks that there are other causes than the quality of the rubber influencing the duration of valves, such as a bad construction of grid seats and covers, employing them as bending valves under too great a pressure, or from the action of lubricants mixed with the water coming in contact with them. The conditions of service under which the rubber should probably last longest, are as circulating pump valves, where the hight to which the water has to be thrown requires but a low pressure, and the temperature ranges from 28° in cold, to 83° Fah. in tropical seas. The actual results obtained from two valves taken from the same steamer were clearly shown by Mr. Syme. Each was seven and five eighths inches diameter by five eighths of an inch thick; but one was white in color, and of a specific gravity of 100$\frac{5}{16}$ lbs. to the cubic foot, of the quality known as "pure." The other was a "mixed" of a drab color, and had a specific gravity of 73$\frac{5}{8}$ lbs. to the cubic foot; while, however, the latter withstood 90 days' steaming, the former only worked 21. In both the rubber was in good condition, but was split outwards from the hole in the center. Mr. Syme considers that they were both too dense, and while thinking that the white specimen would be the best for cold water or hot water untainted with grease, he is persuaded that the size and curve of the valve guard had more to do with their early destruction than the quality of the rubber. In this case the guard was only four and five eighths inches diameter, leaving a projection of one inch and a half of rubber all round the cover; thus the rush of water acting on a leverage of one inch and a half to five eighths of an inch thick, turned up the edge of the valve into the form of a cup at each stroke, tending to tear and split the rubber. To obviate this destructive action Mr. Syme lays down a rule that circular valve covers should have a *minimum* diameter only two thicknesses of rubber less than that of the valve, and in foot valves or oblong suspended valves, only one thickness of rubber less. The mischief done by making the valve cover too small was further proved by an air pump valve which had been in action for 28,000 miles. The cover had a diameter three inches less than the rubber, which, originally three fourths of an inch thick, was worn away to one quarter of an inch at the thickest part.

It appears, however, that the air pump valves are the most unreliable in duration, presenting a puzzle which it is scarcely possible to explain. Mr. Syme exhibited specimens which had been employed in single cylinder condensing engines for periods ranging from a few months to twelve years. One of these, constructed of pure vulcanized rubber nine sixteenths of an inch thick, worked only nine months, and was found to be black and rotten, being more like strong size or glue than vulcanized rubber. It was worn on both sides, but in all probability would have lasted much longer if it had not been fixed at the center, and compelled to beat in one po-

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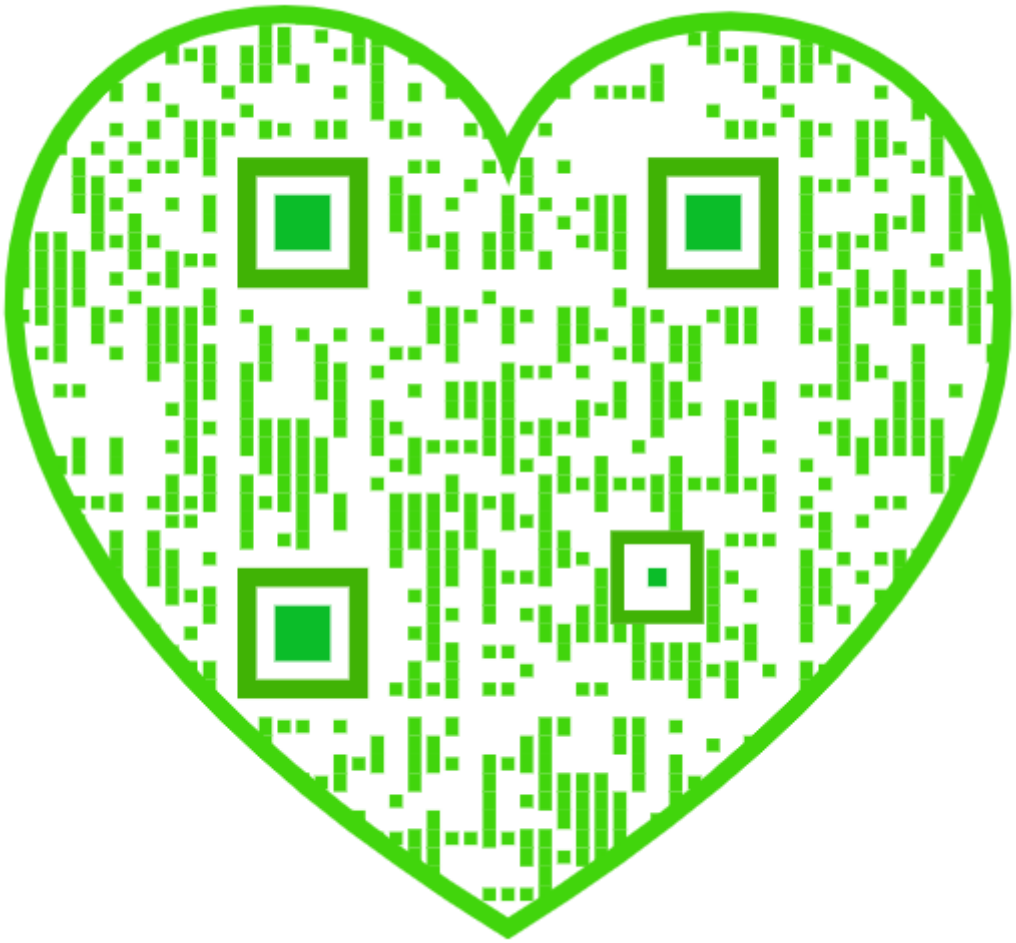

sition. In extreme contrast to this was a valve which had been in work for twelve years. It had a specific gravity of 75⅝ lbs. to the cubic foot, and was probably seven eighths or one inch thick when new, the portions still sound retaining their original elasticity. This valve, however, was constructed of a mixed rubber, and Mr. Syme considers that rubber to which a metallic pigment is added, in addition to the usual quantity of sulphur for thorough vulcanization, is best adapted for the construction of air pump valves, the specific gravity being from 72 lbs to 77 lbs. per cubic foot. He thinks that pure vulcanized rubber is dissolved and worn away more rapidly when acting in oily water than the "mixed," which is protected by a pigment impermeable by oil or fluid grease. The general conclusions drawn from the examination of these specimens were that circular valves should be allowed to rotate, and that the angles of the apertures in the grid plate and the edges of bearing bars should be rounded off, as when these are left too sharp and the valve beats always in one position, the rubber is cut, and the oil getting in produces a viscid effect in each incision.

Speaking of oblong foot or discharge valves, Mr. Syme says they should be of a third quality mixed rubber from 92 lbs to 102 lbs. per cubic feet, and not above three quarters of an inch thick, because within certain limits the thicker they are, the shorter their life, from the fact that, being fixed along one side, when thrown back the difference in stretching between outer and inner curves tends to break the valve—this quality of rubber having too little elasticity to withstand extreme bending for any length of time. In modern compound engines the cause of the destruction of rubber air pump suction and discharge valves is the large quantity of lubricant —oil or grease—which permeates or saturates the steam before passing through the two cylinders, and all of which passes over the faces of the rubber valves among a much smaller proportion of water than in the older condensing engines. In order to prevent this destructive action as much as possible, Mr. Syme suggests that these valves should be constructed to work without bending—rising and falling as some feed pump valves do; by which arrangement it would be possible to employ a heavier rubber, and one better adapted to withstand the action of solvents.

Referring to the applications of rubber for packing joints in steam pipes, Mr. Syme showed the rapidly destructive effects of high pressure, high temperature, and lubricated steam on best red rubber. A flange joint of a supply pipe immediately under the injecting lubricator (best sperm oil) was packed with red rubber one sixteenth of an inch thick, the pressure in the pipe being 40 lbs. In three to four months it was eaten through to the bolt holes—in six months quite through. Joints of the same thickness, used for the high pressure cylinder covers, further away from the lubricators, stood from six to nine months before being eaten through to the bolt holes, while those in connection with the low pressure steam lasted two years and more. This shows that superheated, high pressure steam, permeated with best sperm oil, destroy vulcanized rubber very quickly, a result which might have been anticipated when it is known that rubber vulcanized at about 300° Fah. becomes quite soft in hot air at 460° Fah.

We shall probably return to this subject in a future number, and give illustrations of various applications of india rubber in mechanics, with some proposed improvements by Mr. Syme.—*English Mechanic.*

EXPERIENCES OF A BUREAU OFFICER.

[Extract from a speech of Hon. S. S. Fisher, late Commissioner of Patents.

In one of my earliest interviews with Secretary Cox he had called my attention to the act of March 2, 1853, and suggested that no one should be nominated who had not passed a rigid examination. Indeed, he proposed that we should go farther. A tremendous pressure was, of course, being made for the removal of clerks from all the bureaux of the department. There were some drunken, ignorant, and worthless men in all of them, but the ax was not to be laid at the root of all such trees. On the contrary, those whom we were most earnestly besought to remove were frequently among the most intelligent, experienced, and skilful employés. Their offence was not that they were incompetent, but usually that they had spoken against the impeachment of the late President. This view, which they shared in common with not a few members of the dominant party, was by no means to be overlooked or atoned for by reason of their admitted capacity or valuable experience. As it really seemed as if the outcry for the creation of vacancies for the hungry crowd must in some way be satisfied, and as there was good reason to believe that a large part of the hostility to individuals arose in great measure from the fact that they were in while their accusers were out of office, the Secretary proposed that a thorough examination of the entire department should be made under the act of 1853, and that men should be dismissed for incompetence rather than for a variation in the shade of their Republicanism.

The act of 1853, after providing for the appointment of four classes or grades of clerks in the various departments, proceeds as follows: "No clerk shall be appointed in either of the four classes until after he has been examined and found qualified by a board, to consist of three examiners, one of them to be chief of the bureau or office into which he is to be appointed, and the two others to be selected by the head of the department to which the said clerk will be assigned." Here is authority amply sufficient for the inauguration of a thorough civil service reform. It is obvious that the examination here referred to may be made as searching as desired; that every precaution may be adopted to insure its entire fairness; that such examinations may be either mere pass examinations, or may be made competitive, and that the President of the United States, as the executive head of the government, might if he chose, without further hesitation, issue a general order controlling all the departments, and establishing therein the principle of competitive examinations. There were circumstances which rendered the application of this statute to the Patent Office a matter of comparative ease. If I had been an applicant for the office of Commissioner, and had obtained it by reason of the active exertions and warm recommendation of Senators and congressmen, I should upon taking office have many debts to pay. It would have been hardly the fair thing to say to one of my Congressional friends that his candidate could not be received on his recommendation, but that he must first pass the ordeal of a stringent examination. He would have replied, "Why you were yourself appointed upon my recommendation. You have passed no such examination. If my indorsement was good enough to make the head of a bureau, it ought to be amply sufficient to guarantee the fitness of one of his subordinates." And then he would, perhaps, gently remind the reluctant officer that the influence that could make might also unmake, and that he must of course "provide for his friends." But it is obvious that if this gentleman's nominees were appointed without proper examination, that the independence of the office was lost, and that other members would demand the same consideration for their indorsement of their candidates, until the old system was fully inaugurated.

It was my good fortune not to have a single debt of this kind to pay; to feel conscious that the man did not live who could ask for office for himself or friend as the price of word or deed on behalf of my nomination. There was no reason, therefore, why a stringent examination should not be provided for all who wished to keep their places, as well as for all who longed for those places and besieged our doors to obtain them. Such an examination was made. To say that it caused a commotion would be to state the effect of the order in very faint terms. Some came to it with fear and trembling and even with tears, others came with curses; some refused to come at all, but preferred to resign at once. Of the latter, one man, in order to heap coals of fire upon my head, while tendering his resignation, begged me to accept a small copy of the Bible. In the volume was a slip of paper containing the beatitudes in Latin, with a note requesting me to take notice that it was from no want of education or fear of the result of an examination that the donor declined to submit himself to the rule. The Latin quotation was evidently copied from a Latin Testament, and was unfortunately copied wrong, containing a blunder that no scholar of the language could have made. This examination resulted in several dismissals, and these immediately brought to our doors the inevitable Congressmen. We were told that our examinations were a humbug, or that they were so arranged as to kill off the particular men who were dismissed. Our good faith was more than doubted, and our common sense was broadly questioned. One gentleman who appeared as the champion of the most worthless, reminded me that he was a member of the Committee on Appropriations, and that the former Commissioner had experienced much difficulty in obtaining the necessary funds to carry on the business of the bureau. As this argument failed to reverse the inexorable figures of the examining committee, he took his hat and departed in wrath.

Another of the dismissed, having plied me unsuccessfully with a Senator and a member of the House, proceeded to take the matter into his own hands, and wrote to me about once a week, calling upon me to repent of my sins, to read my Bible more, to do justice to him and reinstate him in office, to turn out his enemies, or prepare to meet him at the tribunal of an unprejudiced judge in another world. I give one of the shortest of these letters entire: "Is it not singular," says the writer, "that you should have selected to be dismissed one so thoroughly radical as myself—the only one in the four model rooms of the same religious profession as yourself—one kind to the poor, even beyond his means, and recommended by the best of men? Remember, I am writing to a person who professes to delight in truth, and one who will shortly stand before a supreme tribunal. Can you there be justified?"

Another says: "Now, S. S. Fisher, if your Masonry is greater than your religion, God will curse you. Repent before it is too late. See Psalm 101, verse 5. Reform the draftsman's and model rooms, dismiss the superintendents, and then pray, and may be God will hear you."

Another laid his complaint before the Secretary of the Interior, and said: "Allow me to call your attention to the accompanying letter of Mr. Wade, and to say that notwithstanding that letter and my long service in the Republican party, I have been dismissed by Mr. Fisher. The late Commissioner of Patents was removed in consequence of his politics not being of the proper stamp, and Mr. Fisher was put in his place because his are of the proper stamp, and yet Mr. F. selects me for dismissal. I wish you would have Mr. F., who doubtless has been urged to this by some personal or political enemy, to reconsider his action and have me reinstated, that I may not be taunted or triumphed over by political enemies." The sublime coolness of this appeal will be better appreciated when it is added that in an examination in which the highest mark was 100 and the lowest 1, this man received 14, and his utter inefficiency was notorious to every one who had dealings with the office. In the application of the system of pass examinations to applicants for admission to the bureau there were found to be many practical difficulties. In the first place the law was sixteen years old. It had been nominally observed in many of the departments, until at length it had notoriously become a mere form, was habitually disregarded, or totally ignored, and was found to be convenient only for the purpose of getting rid of some man who was sacrificed by an unfair application of it, or it was manipulated for the benefit of some favorite who was allowed to slip through its meshes. It was in bad repute. Instances were current, and were authentic, in which the examiners had been requested to make the proposed test a mere formality. Many who had been subjected to it were able to tell of trifling questions concerning routes of travel or the state of the weather, or the health of their families, or the welfare of their aged parents, which comprised the total examination as to their education or capacity.

THE APPLICATION OF STEAM TO CANALS.—NO. 5.

BY GEORGE EDWARD HARDING., ESQ., C.E.

We close the list by calling attention to the arrangement for applying steam power to canal boats, which has been recently designed and practically operated in the United States by Mr. Thomas Main, mechanical engineer, of New York, and presented in longitudinal section and plan on the diagram. It will be seen that it possesses all the happy features for obtaining propulsion by steam on narrow channels, for which many have striven, but none before fully accomplished; but, as has been justly remarked by a modern writer, "an invention is progressive in a regular series." There may be a long order of elementary principles developed without the occurrence of a single practical result, so far as any useful application is concerned, but the perfect machine will be found by somebody. Analyze the diagrams, and there will be found a propeller placed in the bow of the boat (its advantages are readily seen), working in a channel underneath the vessel. The peculiar sloping of the channel is the most convenient arrangement for overcoming any tendency to create a wash, which has been, in some form or under some name, the object of several inventions. The high pressure machinery and tubular boiler is the very locomotive engine so strongly urged by Mr. Fairbairn, only in this instance the inverted cylinder and upright boiler economize the space to the utmost. In fact, the general position of both the channel and the motor interferes least with the cargo bulk; and the water, after passing the propeller, is deflected in the line of least resistance, and passes under the entire length of the boat, to form scarcely a ripple upon the surface, while the channel sides are a safeguard against any lateral waves. It may be asked if the peculiar shape of this channel does not cause friction of the water, and great loss of power. This would certainly be inconvenient in any case of high speed, but in the slower movement of canal traffic we shall not find any appreciable loss from this cause.

A boat constructed on this principle has been for some time regularly employed upon the Erie Canal in America, carrying, besides the machinery, 200 tuns of cargo, at a rate of three miles per hour, including lockages, or seventy-two miles in twenty-four hours, consuming only a tun of coal, at $5, against $28·50 for two horses' towage for the same distance—a saving of half the wages of crew, and transporting the goods in the same proportion of time—and, additional to its own cargo, it can tow a similar loaded barge at very nearly the same speed. This boat can go through a lock in six minutes, against twelve minutes required for a horse boat, and is then handled by one man with ease. There is no injurious action on the banks, and the boat can leave the canal and proceed as quickly and safely on river navigation with her self-contained power. In twelve months, such a boat, 70 feet long by 16 feet wide, and 9 feet depth of hold, with an 8 inch cylinder, driving a 4½ feet propeller, can pay for her entire cost from the saving over horse boats, to say nothing of the certainty and dispatch which alone insures the confidence of the mercantile community, and is the foundation of extensive patronage.

Every comparison between the expense of steam *versus* horse carriage that is attainable, gives great economy to the former system; and, sooner or later, with her canals enlarged, and steam propelled boats giving a system of trackage indefinitely superior, cheaper, and more regular, than anything hitherto dreamed of, England's internal navigation will take a position worthy of those talents that conceived them. The party of croakers who are ever found in opposition to improved communication, will, with the present employés and certain railway interests, loudly cry out against any innovation trenching on this special province, and predict sad disaster to the country by any interference with the ancient customs now cherished so fondly; but if the step is not now taken in the spirit of enterprise, it will be forced upon the country as a necessity, after other nations shall have led the way.

Notwithstanding the immense amount of freight conveyed by railways, now burdened nearly to their utmost limits, we find trade, with its gigantic strides, tasking the carrying capacity of the canals, in spite of their many disadvantages, and ever steadily increasing in its demands. In 1835, before the opening of the London and Birmingham Railway, the through tunnage conveyed on the Grand Junction Canal was 310,475 tuns, and in 1845, after ten years opposition of this road, the tunnage had increased to 480,526 tuns; while, at the annual meeting of the canal proprietors, in 1860, the receipts for the previous six months had been the largest ever experienced.

America, at the present moment, is alive to the necessity of canal improvement. Nearly £4,000,000 have recently been recommended by the Canadian Canal Commissioners for the enlargement and construction of slack water navigations. And, within a few weeks, the Legislature of New York have introduced a bill offering a reward of $100,000 for the best plan of canal navigation, in the substitution of steam, or

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other motive power, for animal labor; and England should not remain backward in the race, especially since to her canal system she owes so much of her present prosperity and greatness.

The cumbersome barge, with snail-like advance, feebly contrasts with the iron horse, thundering by with its speed and power. Yet, improved as they should and must be, canals will always continue to form an essential part of internal communication, to be missed quite as much as roads, railways, or even the telegraph itself.

In conclusion, the author expresses his sincere regret that this glance at the canal systems, and the mechanical methods which have been suggested as applicable to the propulsion of their boats, had not fallen into abler hands. Its compilation has been gathered from many sources and authorities, with but limited time spared from usual avocations. But, trusting that it may at least draw attention to a most important field in the economy of nations, such as it is, this paper is presented, in the hope of a favorable reception.

PHRENOLOGY AND SPIRITUALISM.---A LIVELY DISCUSSION.

At an ordinary fortnightly meeting of the Anthropological Institute, in London, the Secretary read a paper, written by the Rev. Canon Calloway, M.D , of Springvale, Natal, Western Africa, on "Dreams, Sympathy, Presentiment, and Divination, among the Natives of Natal." He began by saying that in all ages and in all parts of the world, certain strange phenomena have been seen, which by some have been ascribed to delusion, by others to imposture, by others to disembodied spirits, and by others again to the devil. The author argued that these phenomena probably had a natural source, and were probably due, in great part, to the mental condition of the observers; at the same time, he held it to be utterly unscientific to deny the existence of spirits, and the possibility of their playing any part in the affairs of man. He then proceeded to explain that certain changes in the state of the brain will cause men to see spectral illusions, and that a man who wakes very suddenly out of a dream, with the image of the person he saw in the dream still impressed upon his brain, sees that person at the moment of awakening, and believes, therefore, that he sees a spirit. Some spectral appearances he could not explain in this way, such, for instance, as the ghosts sometimes seen in haunted houses, by persons who slept therein, without knowing the house to be haunted.

In the course of his paper, he described the clairvoyant powers of some of the Zulus, and finally narrated how some of the natives went to consult a woman, in whose presence the spirits were said to talk with audible voices. A native Kraal among the Amadunga, on the Tukela, having had some quarrel with their people, settled with a relative among the Amahlongwa. After settling there, a young child of theirs was seized with convulsions; so some cousins of the child went a day and a half's journey to consult a woman who possessed spirits. The woman had never seen the inquirers before. The cousins sat on the floor of the hut, and the woman in the center, in broad daylight. Soon a voice, like that of a child, was heard near the roof of the hut, and this voice told the cousins that they had come to seek the advice of the spirits about a child suffering from convulsions; the voice also told them all kinds of things about their private family affairs, and told them what to do to cure the child. The natives then returned home, followed the instructions given, and the child recovered.

Dr. Calloway offered no explanation of this case, and he closed his paper by saying that, although these phenomena "cannot be ascribed to the direct agency of good or evil spirits alone, yet they may be intimations that not only can the soul of man look out upon the world around him, and become cognizant of it through the organs of sense, but that it can look in another direction, and, without the organs of sense, obtain a knowledge both of what is going on in the world beyond the sphere of the senses, and even look into futurity, and hold communion with the invisible world of spirits."

Mr. J. W. Jackson, F. A. S. L., of Glasgow, said that, in the first place, he did not think that the author had sufficiently explained his subject by the aid of phenomena, well known to men of science, for all the phenomena of dreams can be reproduced by means of phreno-mesmerism. He knew that subjects like these were much tabooed by the Anthropological Society, still they formed a part of the study of the science of man. When a man is in the mesmeric sleep, the operator has but to excite the organ which leads to dreamlife; if it be desired to show him somebody in distress, the operator has but to touch the organ of benevolence; if veneration be excited, he will perhaps fancy that he is in church; if the organ of philoprogenitiveness be touched, and the subject be a lady, she will perhaps fancy that she has an imaginary baby, and will begin to nurse it with the greatest care. Dreamlife is a reversal of the waking state. In the former, objects excite ideas; in the latter, ideas place objects before the consciousness. Community of sensation may also be produced by mesmerism; and what the operator feels and tastes, the patient will also feel and taste; this is the case sometimes when the operator does not touch the patient, but is on the opposite side of the room. Two minds may be united in the same way, and then thought-reading takes place. They might assert that these things did not take place; but they do occur, and every mesmerizer has his thoughts revealed to him, at one time or other, by his subjects. The paper just read was interesting, because of its bearing upon the state of the psychology of the savage; although the savage had a coarser physique than the European, he is more susceptible, perhaps, to psychological influences than the white man, because he lives nearer to nature; and all over the world, where men live closer to nature, they are more susceptible to mesmeric influences. There is no question that many of the phenomena now taking place among spiritualists throw much light upon what is taking place among the natives of Natal, and many of the things described in the paper now occur in our midst. He had seen heavy articles moved about in opposition to the law of gravitation, notwithstanding all that Professor Tyndall and others might say to the contrary; at the same time, he would not say that spirits moved them. These things are taking place around and about us. What is the value of the opinion of a man on this subject who has never seen these things? He had seen them, and knew them to occur. Many spiritualistic facts are mesmeric in their origin. He should like to hear a paper read before the society on the medicine men of North America; also, if some of our Indian officers would give a paper on mesmeric phenomena among the Hindoos, it would be interesting, for India is a great storehouse of extraordinary psychological phenomena. The great thing is for the writers of such memoirs to state what they know without fear. Dr. Calloway had not been afraid to speak the truth that was in him, and that was the great merit of his paper.

Mr. W. G. Dendy said that the spiritualists must not have the tether that evening. As regards Dr. Calloway's paper, what was true in it was not new, and what was new was not true. Dr. Calloway was egregiously wrong in writing it, and he ought to be ashamed of himself; Mr. Jackson, also, was a great man in stating things of which he was not ashamed. He wished that Sir John Lubbock had been present that evening to defend the savages, for many of the facts mentioned in the paper were mere humbug. He thought that Mr. Jackson was correct in much that he had said about dreams, but when he said he could excite a particular organ, he thought it was an entire mistake; it was the same great error that Gall and Spurzheim fell into. By mapping the skull, it was not possible to map the brain underneath it. Phrenologists place the organ of color in the forehead, whereas the nerves from the eye go a long way back into the center of the brain, so to have all that humbug stated at that meeting was too hard to bear. He thought that when their old friend, Dr. Donovan, ceased attending their meetings, that he and phrenology had gone out together. He very much regretted that such a farrago had been placed before them to discuss, and he rose to inveigh against the paper.

Major S. R. T. Owen said, that whether the brain could be mapped out or not he did not know, but almost all the experiments mentioned by Mr. Jackson he had personally tried, again and again; he knew them to be true, so took to himself all the blame awarded by Mr. Dendy.

Mr. Prideaux said that he had seen the phenomena of what is called phreno-mesmerism, and thought that they were produced by the belief of the operator; the operator believed that a certain part of the head was connected with certain organs, and because of this belief the phenomena were produced. Phrenology itself must be proved by facts, and not by opinions, and if Mr. Dendy would bring painters and color-blind people to him, whom he had never seen before, he would look at their heads, and would separate one class from the other.

Mr. Charlesworth said that the paper was all rubbish, and wholly unworthy of discussion. The society would have been much better employed in discussing phrenology and mesmerism than the facts in that paper.

The President said that the subject was one which well deserved investigation, and it was one which labored under an immense amount of prejudice. In some ages, great credulity was the rule, and in others, a great degree of skepticism; every pretence at a ghost was once believed in, and now, perhaps, we go too far in an opposite direction. He wished that some test could be applied to the phenomena, and he thought that the whole question was one which came within the province of the Anthropological Society. He thought there were certain cases of ghost seeing not readily explainable by any theory put forth that evening, such as those instances where people had died in foreign lands, say in India, and appeared to one or more friends at home at the moment of death. Those cases, he thought, could not be got over. The paper was valuable as showing how the opinions of savages agree with our own on such subjects. It was a fair subject for inquiry, and prejudice should be laid aside Could not some scientific test be applied to these things? He rather thought with Mr. Jackson, and attributed more value to the paper than had been done by some of the other speakers, though he did not exactly see the connection of phrenology with the subject. He thought that the society should scientifically study the subject, try it by tests, and dismiss prejudice as much as possible.

Mr. Prideaux asked permission to speak a second time, and said that the phenomena were real. He had had some talk with the Bishop of Winchester about them, and the bishop expressed his opinion that the phenomena were governed by exact laws, like everything else in nature, only as yet we do not know the laws. One difficulty in the way of scientific investigation is the uncertainty and fugitive nature of the phenomena; the presence of persons adverse to their occurrence interferes very much with the effects produced. Their strange nature was no argument against them, for if eclipses only took place once in a century, the testimony as to their occurrence would be disbelieved. He was quite ready to take his share of obloquy in all matters connected with mesmerism and spiritualism, but with respect to the latter subject he was not satisfied as to the cause of the phenomena.

MEDICINE stains may be removed from silver spoons by rubbing them with a rag dipped in sulphuric acid, and washing it off with soap-suds.

Duration of Animal Life.

The duration of the life of any particular animal depends on its kind of structure, elementary and anatomically, as well as upon its place and mode of subistence. Some have their lives extended to a century, whilst others live but a few hours. If we examine the longest lived, such as some reptiles, the whale, some kinds of birds, the elephant, and man, we will find the tissues of which they are composed, are so slowly changed, under the normal condition of their lives, the growth, absorption, and renewal of them being of such a character, that the induration which makes the decrepitude of age, is slow in taking place. The land tortoise, a reptile well known for longevity, is constructed of a gelatinous muscular fiber, with comparatively soft bones and shell. He lives on vegetable matter, moves about slowly, becomes fat, and is torpid during the cold weather. With few enemies to molest him when encased in his shell, those that pass from the egg state to this defence live year after year in lazy security, and answer the purpose of their creation. They do not harden and grow stiff by excessive labor as do man, the horse and the dog, and thus become prematurely old. Fish, particularly the larger kinds, attain great age. Whales are supposed to live a century. But little accuracy can be expected in computing the years these monsters roam through the different seas, but evidence from harpoons bearing ship marks, and dates, found imbedded in captured whales, is conclusive that the adult whale will live the greater part of a man's life without undergoing much change. The slow propagation of these monsters, the softness of their muscular fiber enveloped in fat, their food, all tend to that slow assimilation and expenditure of nutritious matter, which is most consistent with a long life.

The peculiar life element, nitrogen, plays an important part in the duration of animal existence. Where the food consists almost entirely of nitrogenous compounds, such as flesh, the greater amount of vitality imparted to such as live on this food, hurries them through their existence, other conditions being equal, in a shorter time than those which feed on a less stimulating nourishment. The tortoise and the whale are supported by vegetable, and other matter, that contains but little nitrogen compared with the food of carniverous animals. The whole lion tribe, whatever may be their magnitude and organization, soon show symptoms of age. The exertion necessary to procure food, strains every muscle to its greatest tension, and these muscles need constant supplies of highly animalized matter to restore their waste. This wearing away, and renewal, hardens the tissues that are thus constantly in a state of action until they become unfit to perform their perfect functions, and at a period, early, compared with the time it took to bring them to maturity, these carnivora fall into decay. An old, worn out lion is not unusual in the jungle. The buffalo, rhinoceros, and hippopotamus, less stimulated by their vegetable food, and less exercised in its procurement, live to a greater age.

Without bringing other examples in proof of the kind of food and exertion necessary to maintain life having an influence upon longevity, the laws that operate to this end, when duly considered, will show the harmony of the whole animal economy. The time appointed for the individuals of each race to live, seems adjusted to the accomplishment of their peculiar work. The ephemera, in the sunshine for a few hours, fulfil their function and die. Their larvæ are longer in coming to maturity, but one short season rounds the whole existence, from the embryo to the perfect insect, and during these stages, whether it has been created for devastation or to be devoured by some other, the wave of life has swelled and subsided. All that remains can rest until another season, when by the air and the sun it will be set in motion to repeat the same phenomena. Other beings, having purposes to accomplish that cannot be embraced in so short a period, have a slower organization.

It would be curious to trace the connexion between the elements of the air and influences of the sun in the life process, and to accurately determine how much nitrogen, one of the elements of the air, and the principal constituent of all the vital parts of animals and plants, has to do with the duration of organic existence. That kind of structure requiring altogether food of which this element constitutes the greatest part, such as the viscera and flesh of animals, should, with the vigor imparted to it by such aliment, live as long as that depending on the scanty supply of nitrogen obtained from vegetables, is not consistent with the idea that the decrepitude of old age is nothing more than the hardening of tissues by the amount of resistance they have had to overcome. The life force is most rapidly and most powerfully expended in the carnivora, and if they are such as by their habits require a daily supply to meet the exercise to which they are daily subjected, their lives must be shorter than those as continually, although not as powerfully called into action, that feed upon vegetables. In the latter, the life processes being slower, induration is later in causing decrepitude.—*James B. Coleman, M. D., in Beecher's Magazine.*

Curious Egg.

A correspondent informs us that, a few weeks since, at Westford, Mass., he saw a newly broken egg, having the usual quantity of white and a yolk, and, in addition, another (smaller) egg, an inch or more in diameter. The inner egg contained white only.

The hen who laid this egg is a mere tyro in science, and a little learning, in egg laying as in other things, is a dangerous thing. No doubt the hen's idea was, that by putting an exterior jacket on the inner egg, superheating might be achieved, and the egg would hatch itself. But she carelessly omitted to put the yolk in the inner shell. She must experiment further before she applies for a patent.

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Experiments on the Strength of Cast Iron Girders.

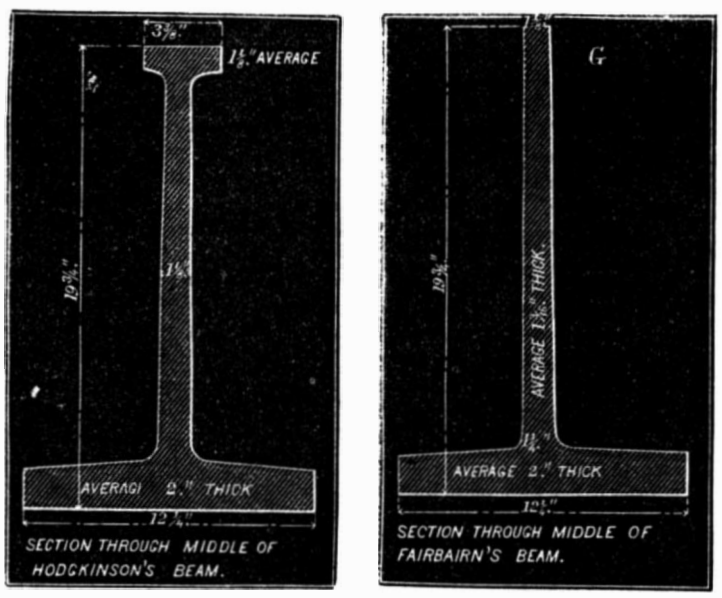
The New York Legislature passed a law, at its last session, requiring that every column girder and beam, having a span of eight feet and upwards, and intended to support a wall of stone or brick, or any floor, or part thereof, shall be tested previous to its use in any building, hereafter to be erected, in the city of New York. The margin of safe weight for large beams has hitherto been computed from standard results obtained from tests of smaller ones. To test the reliability of this method, an interesting series of experiments was recently made at the foundery of J. L. Jackson & Bro., Twenty-eighth street and Second avenue. The tests were made by means of a hydrostatic press. A number of prominent officials architects, and engineers, were present. The experiments were conducted by Mr. P. H. Jackson, a member of the above-named firm. The following is a synopsis of the resul's, as communicated by Mr. Jackson:

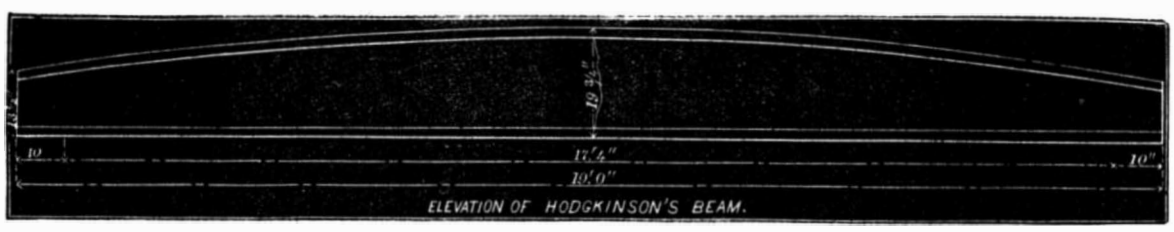
FIRST SERIES OF EXPERIMENTS, JUNE 23, 1871.

This was a Hodgkinson form of beam, whose areas of bottom and top flanges were in the ratio of 6½ to 1. It was made of such iron as is in common use for building purposes. Area of bottom flange, $12\frac{1}{4} \times 2 = 24{\cdot}5$; top flange, $3\frac{3}{8} \times 1\frac{1}{8} = 3{\cdot}8$; vertical rib, $16\frac{3}{8} \times 1\frac{1}{8} = 18{\cdot}4$; 4 fillets, 1; sectional area in middle, 47·7 inch.

Breaking weight in middle, computed by the Hodgkinson formula: $12{\cdot}25 \times 2 \times 19{\cdot}75 = 483{\cdot}875 \div 208 = 2{\cdot}326$. $2{\cdot}326 \times 514 = 1195{\cdot}564$ cwts. $= 59\frac{1}{2}\frac{5}{0}$ gross tuns.

Experiments.	Tuns.	Deflection.	Pressure taken off permanent set.
1	15	7-16 inches.	
2	20	9-16 "	2-32 inches.
3	25	21-32 "	2-32 " full.
4	30	3-4 "	
5	35	2 1-32 "	4-32 " full.
6	38	1 "	5-32 "
7	41	1 3-16 "	7-32 "
8	44	1 11-32 "	
9	47	1 1-2 "	
10	50 (broke)	1 5-8	





WEIGHT OF BEAM, 2,680 POUNDS.

In accordance with Hodgkinson's formula, the safe weight should not exceed one third of breaking weight, or 20 tuns.

The test shows that the safe weight should not exceed $16\frac{2}{3}$ tuns, being 20 per cent excess of formula over test.

I do not believe, if the pressure had been taken off at $16\frac{2}{3}$ tuns, and allowed to remain off twenty minutes, before noting deflection, that there would have been any set whatever indicated, which would have shown that the elasticity was not impaired in the least at that weight.

You will observe that, at 20 tuns, when the weight was taken off, the gages showed $\frac{1}{16}$ in permanent set. But even this is questionable, to my mind, as a permanent set, since the beam would have conformed more to its original form, provided it had been left at a state of rest after the 20 tun test. I can only attribute the deficiency of strength in this beam to the following: In all founderies engaged in the manufacture of iron work for building, it is usual to melt soft iron, principally "Scotch pig," either at the first or last of the heat, usually at the first, for cornices, capitals, and all other light castings, which require to be soft in order to be filed, but do not require any extra strength. It may have been that some of this iron was in the Hodgkinson beam. Besides, when metals of various densities and formations of grain are mixed, the different particles in cooling have a tendency to adopt their former structure, and therefore if the metals are not properly mixed the strength of the casting will be considerably impaired by unequal contraction.

SECOND SERIES OF EXPERIMENTS, JUNE 23, 1871.

Same section as beam used in first experiment, but without compression flange, G.

This is a beam of the Fairbairn form of 1825, but somewhat greater in its ratio of resistance to extension and compression. In this beam the area of the bottom flange, subject to extension, is, to the area of the top of the vertical rib—one inch in depth, subject to compression—in the ratio of 21 to 1; while in Fairbairn's beams the ratio did not exceed 16 to 1. Bottom flange, $12\frac{1}{4} \times 2 = 24{\cdot}5$; vertical rib, $17\frac{3}{4} \times 1\frac{3}{16} = 21{\cdot}1$; two fillets, ·6; sectional area in middle, 46·2 inches.

Taking the breaking weight as per section of Hodgkinson beam made with compression flange, it would be (see first experiment) $59\frac{3}{4}$ tuns. Then taking Hodgkinson's section of the greatest strength as unity, the ratio for Hodgkinson and Fairbairn will be as 1 to ·754, or $59\frac{3}{4}$: F :: 1 : ·754. F = 44 tuns.

Experiment.	Tuns.	Deflection.	Weight taken off, permanent deflection.
1	15	7-16 inches.	1-32 inches.
2	20	9-16 "	1-16 "
3	25	3-4 "	1-16 " full.
4	30	15-16 "	
5	35	1 1-8 "	5-32 " full.
6	38	1 7-32 "	7-32 "
7	41	1 5-16 "	1-4 "
8	44	1 1-2 "	
9	47	1 11-16 "	
10	49	1 25-32 "	

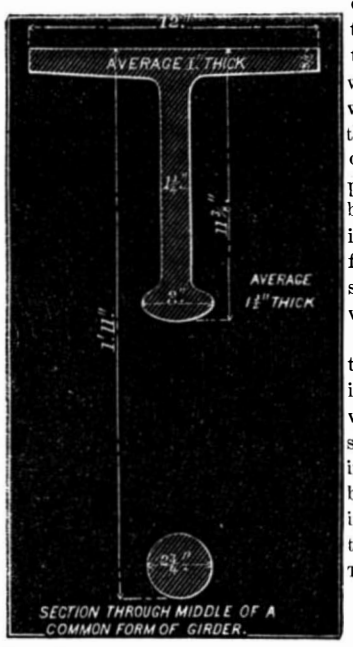
Broke at 49 tuns.

Excess of breaking weight, by test, over that of formula, providing the ratio of extension to compression did not exceed 16 to 1 (this was 21 to 1), equals 5 tuns, or 12 per cent.

At the place of fracture the bottom flange had a bright crystalline appearance, showing that the crystals had been subjected to a great tension; while at, or near, the top of the vertical web, subject to compression, the iron was of a dull blueish color, similar to the appearance of the outside of a pig of lead. Midway between these points the metal had the same appearance as a piece of the casting which I broke off at the end, and which had not been subject to strain.

On the day following the experiment I found the ends of beam at fracture rusted over, as it had rained during the night, or I would have sent you pieces from each of the three places, for your inspection.

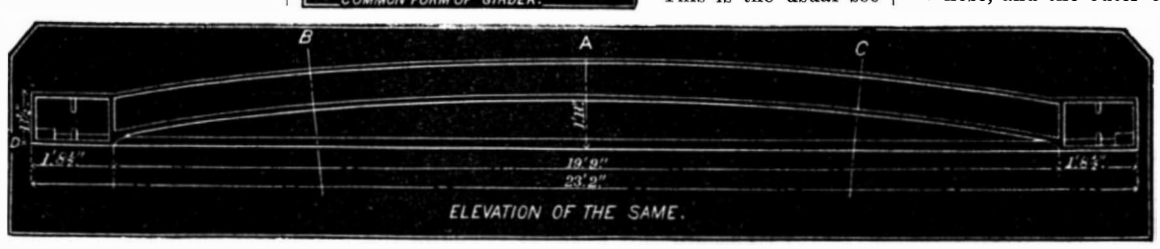
This beam had the advantage over the Hodgkinson beam of lying undisturbed in the sand 20 hours longer. Consequently it cooled slowly, and contraction was more equalized, increasing its capability to resist strain. Besides it was cast downwards. The top of the web, G, if exposed to the atmosphere equally with the rest of the beam, would cool and contract the quickest, by reason of its being the thinnest part of the casting; but, being cast in this position, it was the farthest point from where the atmosphere came in contact with the surface.



Lastly, being cast with the web downwards, all impurities would rise upward to the bottom flange subject to tension, while in the Hodgkinson beam, being cast on its side, the impurities would rise to the flanges uppermost.

THIRD SERIES OF EXPERIMENTS.

This is the usual section of almost all arch girders in common use in New York city, made to sustain four stories of 12 in. brick wall.



WEIGHT OF BEAM, 2,539 POUNDS.

Area of middle section: Top flange, $12 \times 1 = 12$; bottom flange, $3 \times 1\frac{1}{2} = 4{\cdot}5$; web, $8\frac{7}{8} \times 1\frac{1}{4} = 11{\cdot}1$; fillet, 1·0. Total, 28·6. 28·6 inches sectional area in middle = 90 pounds per foot in length.

Breaking weight of this beam, if made straight, without the rod, agreeably to the formula of Hodgkinson: $3 \times 1\frac{1}{2} \times 11\frac{3}{8} = 51{\cdot}188 \div 237{\cdot}5 = 215 \times 510 = 110$ cwts., or $5\frac{1}{2}$ tuns.

Area of rod, 7·562 inches; it was shrunk in ⅛ of an inch less in length than recess made for it in the casting.

Experiment.	Tuns.	Deflection. A.	Deflection. B.	Deflection. C.	Elongation of rod. D.	Permanent set, weight taken off. A.	B.	C.	D.
1	10	3-8 in.	1-4 in.	1-4 in.	1-8 in.				
2	15	5-8 "	11-32 "	7-16 "	3-16 "				
3	18	3-4 "	11-32 "	1-2 "	5-32 "	0	0	0	1-32
4	21	15-16 "	19-32 "	5-8 "	7-32 "				
5	24	1 5-32 "	3-4 "	25-32 "	1-4 "				
6	27	1 5-16 "	7-8 "	7-8 full.	9-32 "	1-8	1-16	1-8	1-32
7	30	1 13-32 "	15-16 "	31-32 in.	9-32 "	1-8	1-16	1-8	1-32
8	32	1 19-32 "	1 1-32 "	1 1-16 "	11-32 "				
9	34	1 3-4 "	1 5-32 "	1 3-32 "	13-32 "				

Broke at 34 tuns.

The bottom flange cracked through, and about half way up through the web. Elongation of rod, $\frac{1}{3}\frac{3}{2}$.

STAINS from acids can be removed by spirits of hartshorn diluted. Repeat if necessary. Rinse off with water.

A Second Street Tunnel under the Chicago River.

The first tunnel has been open to the public for a considerable time, and the second tunnel, the La Salle street, is now completed. The success of these works ought to be an example to the authorities of New York and Brooklyn. We presume that three or four first class tunnels might be laid between these two great cities, for less money and in much less time than the East River Suspension Bridge can be completed.

The Chicago *Times* thus describes the La Salle street tunnel: Entering the tunnel proper, there is seen above, a series of transverse arches resting on iron girders, three feet apart, the side walls being of stone. From the entrance, to the terminus of this section of the tunnel, is 396 feet; the portion covered with transverse arches being 60 feet. Next is a section of the tunnel which is covered with a regular arch of brick work, which, on account of its rough finish, has, in the dim light of the tunnel, the appearance of stone. On each side are noticed recesses in the walls, which are meant for refuge places for policemen in case of a runaway. Double gas jets are provided at intervals of 60 feet. At a distance of 40 feet from the river line is a ventilator, passing up through the arch, constructed of solid masonry, and 6 feet in diameter. Into this leads another ventilator from the pedestrian way. Passing along a well paved road, the single archway, which is 19½ feet in width, ends at a point two feet from the river line, where it diverges into two archways, each 11 feet wide, and separated by a central pier 2 feet 4 inches in width. This wall or pier is pierced, at intervals of 16 feet, with doorways, as is also the pier separating the eastern of the two carriage ways from the pedestrian way. This latter way is 10 feet in width, and is entered by stairways at South Water street and Kinzie street. This double driveway extends 300 feet, when in inverse order come the changes in the structure described at the south entrance to the tunnel. In the center of the tunnel, at the lowest point, is a well 6 feet in diameter, which enters into a main sewer 5 feet in width. This sewer drains the tunnel, carrying the water to the north end of the tunnel, where there is a pumping well, 36 feet from the dock line, from which the water is pumped when necessary. At the north end of the tunnel, at the same distance from the river line, is a second ventilcator, or rather two, one for the carriage way and the other for the pedestrian way. At length, after a walk of 1,900 feet, the other end of the tunnel is reached. The air has been found to be pure, the ventilation good, the walls, except in a few places, dry, and the whole work bears the appearance of one well conceived and well carried out.

Drying Apparatus for Hose.

This invention has for its object to furnish simple, convenient, and effective means for drying hose quickly and thoroughly throughout their entire length, thus having the hose always in order, and not weakened and rotted in spots from being imperfectly dried. Shelves, slats, or racks support the hose in line while being dried. At each end of the shelves, slats, or racks, are partitions, having holes formed in them to receive the ends of the lengths of hose, which holes are of such a size as to fit air tight upon the ends of the lengths of hose. The partitions are made in two parts, the line of division running through the holes that receive the ends of the hose, and the outer or forward parts being detachable for convenience in putting in and taking out the hose. The rack may be arranged so that the lengths of hose may be horizontal, or inclined, or vertical, as may be desired or convenient. A closet is formed at one end of the rack, made air tight, and provided with an air tight door. In the bottom or lower part of the closet is an opening, with which may be connected a pipe leading to a hot air drum or other heater to introduce hot air into the closet, from which it can only escape by passing through the lengths of hose. Ernest Drevet, of New York city, is the inventor of this apparatus.

BURNING CHIMNEYS.—If it be desired to extinguish the fire in a chimney which has been lighted by a fire in the fireplace, shut all the doors of the apartment so as to prevent any current of air up the chimney, and throw a few handfuls of common salt upon the fire, which will immediately extinguish the same. The philosophy of this is that, in the process of burning the salt, muriatic acid gas is evolved, which is a prompt extinguisher of fire.

THE BEST REPEATER YET.—Among the numerous "repeaters" which are constantly being noticed in the telegraphic journals, we have seen nothing more worthy of mention than one which is working "out West" at the present time. It is a young lady operator, who can receive a message on one circuit and simultaneously send the same message on a second circuit with ease and rapidity. This repeater is said to be of unusual elegance and beauty, which we can readily believe, and an entire success in every respect, and good for a "house" instrument.—*The Telegrapher.*

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[For the Scientific American.]

WOOD-BORING BEETLES---THE "GIRDLERS."

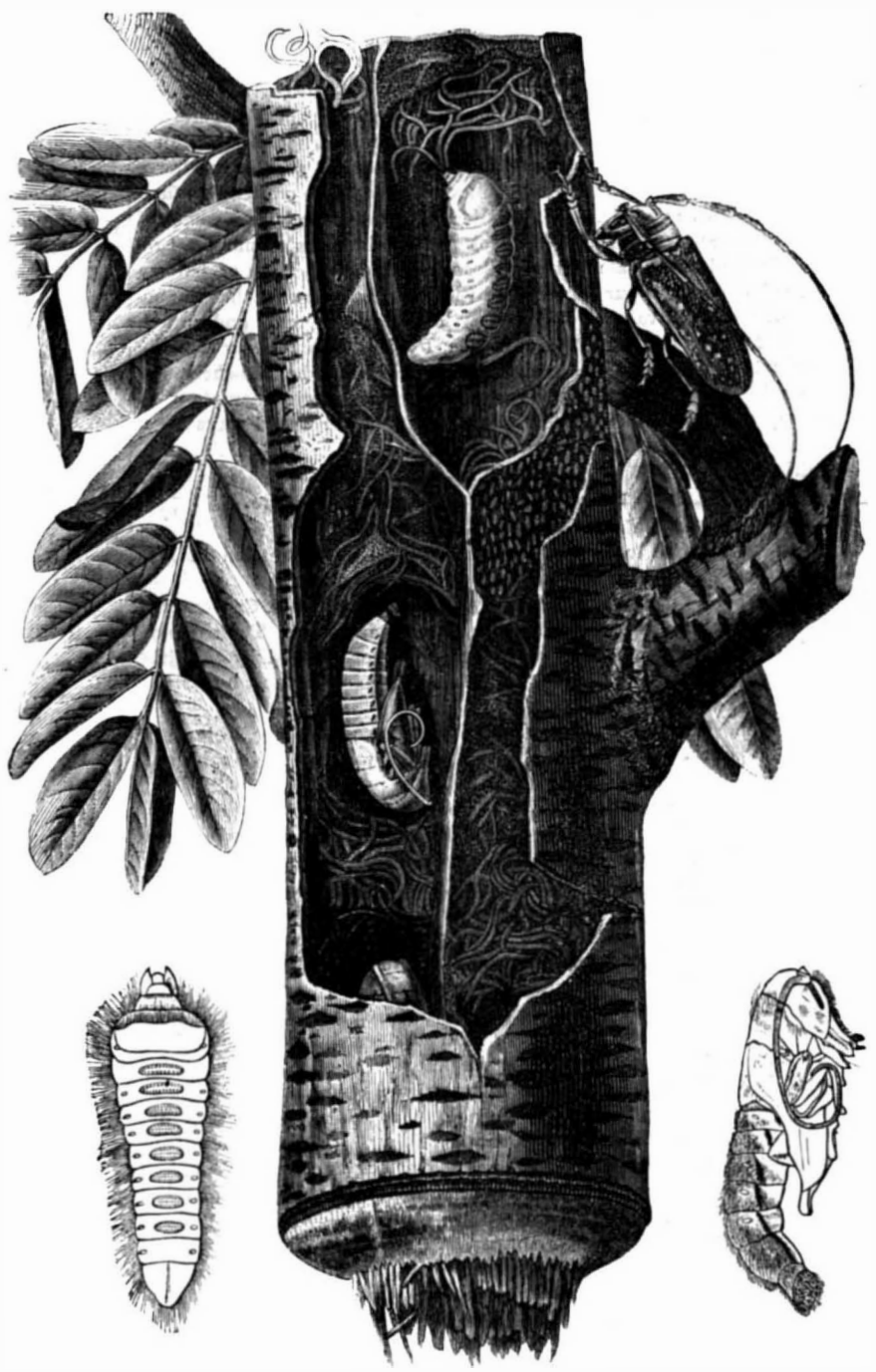
BY PROFESSOR E. C. H. DAY.

The insect figured in the accompanying beautiful engraving (from Blanchard), in the three stages of its life history, is one of the family of *Longicornia*, or "long-horned" beetles; a family also known among entomologists as the *Cerambycidæ*, from *Cerambyx*, one of the most typical of the genera it includes. As the former name denotes, the members of this, a most extensive group, are characterized by the length of their elegant antennæ. They are beetles, generally speaking, of neat form, with slender, often cylindrical, bodies, and moderately long legs. Many species attain to a considerable size, and many are brilliantly colored. They are, therefore, always acceptable additions to the cabinet of the coleopterist. On the other hand, the grubs of by no means a few of them are among the most mischievous of timber destroyers, and there is scarcely a tree that is not liable to suffer from the attacks of one species or another of this universally distributed family.

Sometimes these unsightly, whitish—often footless, maggot-like— larvæ, penetrate the tree while it still seems to be in the full vigor of its growth, boring through the trunk, or making their homes in the pith of such plants as the elder; others hasten the destruction of trees that are past their prime; while others, again, obtain an honest livelihood by removing decayed wood.

The latter, we suspect, was the original and normal occupation of the ancestors of the family, the less commendable practices of the others being probably the results of the necessities of the "long-horned" family, at times when its legitimate labor market was overstocked. For, as in these days of dense population, a man cannot always obtain his living in the trade of his forefathers, but must turn his hand to whatever pursuit offers the best chance, so, likewise, among insects, so great is the struggle for existence, so swiftly do foes multiply against every species, so constantly, though by imperceptible degrees, are all the conditions of existence changing around them, that, if the race is to continue, its habits and its instincts must be capable of corresponding modifications.

We thus find among insects, as among the inhabitants of large cities, instances of most singular and abnormal habits, habits induced by the exigencies in the former of natural, as in the latter of civilized, associations. Yet, however singular and out of the ordinary course may be the instincts which dictate such habits, many naturalists of the present day, nevertheless, consider them, not as original endowments by creation of the creature possessing them, but as gradual developments from simpler instincts, under the influence of a tendency to variation, directed by the necessities of the race in its struggle for existence, during very prolonged periods of time. No voluntary effort on the part of the individual is invoked, as having produced, or even tended to produce, such changes. Creative wisdom, which implies continued preservation, implanted in every race the capability of undergoing such slow and insensible modifications as should correspond to the change of condition to which, in the course of time, it would be subjected. Wherever such correspondence fails in portions of a race, such portions die out; they are no longer required in that form in the scheme of the universe. In this sense, the most extraordinary of instincts, developed from a simpler one, is no less the work of the Almighty Designer than if it had been implanted at the moment of a specific act of creation. The doctrine, in fact, while in no degree lessening our sense of Almighty Power, hightens vastly our recognition of an all-pervading Foresight.



METAMORPHOSES OF THE WOOD-GIRDLING BEETLE.

The insect here figured presents us with a most remarkable instinctive habit. We give Professor Blanchard's history of the picture, in almost his own words: A M. Houllet, sojourning in the neighborhood of Rio Janeiro, heard every night the sound of branches falling from an acacia tree. These branches had been cut around, so that the centers alone were untouched, and they had broken off, consequently, by their own weight, or by a slight movement of the wind. "To whom was the mischief to be attributed? To the negroes of the house, undoubtedly, animated by a desire to cause their master a petty annoyance. But the traveller soon perceived that there was often a beetle (*Onciderus vomicosa*) upon the branch cut off; the coleopter, then, was the author of the mischief! A branch of the acacia was brought home; it contained living larvæ and pupæ of the Onciderus. It is the same branch, laid open and thus inhabited, that we here represent."

The reason of this extraordinary procedure appears to be, that, the eggs of the beetle being laid in a part of the tree in which vitality is very active, there is danger of the offspring, during its pupal or inactive condition, being built in too completely by the growing wood. Such may, or may not, be the true explanation; but, be it so or otherwise, it does certainly seem, at first sight, impossible to account, by any development theory, for such an incomprehensible instinct. Writing of an allied species (*O. cingulatus*), found in our own region, Professor Huldeman recognizes this difficulty: "In our walks through the forest, our attention was frequently drawn to the branches and main shoots of young hickory trees (*Carya alba*), which were girdled with a deep notch, in such a manner as to induce an observer to believe that the object in view was to kill the branch beyond the notch; and, extraordinary as it may appear, this is actually the fact, and the operator is an insect, whose instinct was implanted by the Almighty Power who created it, and under such circumstances that it could never have been acquired as a habit. The effect of the girdling is unknown to the insect, whose life is too short to foresee the necessities of its progeny during the succeeding season."

An error in the above argument consists in overlooking the fact that the instinct belongs to, or subserves the purposes of, the race, and not merely of the individual. The growth of such a peculiar habit must be the result of an accumulation of small changes of instinct, tending in one direction through a vast number of generations. But, if so, do we find instances of instincts less abnormal tending in the same direction? We believe we can indicate one, at least, among these same *Longicorns*. "The larva of the *Stenocorus putator*," says Packard, "nearly amputates the branches of black and white oaks. After becoming mature in the trunk, and just before undergoing its transformations, it gnaws off the branch which contains it, and which consequently falls to the ground." Here we have the very same instinct displayed by the grub, instead of by the perfect insect, and, though it is only a transference of the difficulty—for we are as puzzled as ever to demonstrate its origin in the grub—yet it, at least, shows that the habit of the *Onciderus* is not an isolated case; and we fully believe that, if due attention were given to all the variations of this instinct that are to be found among *Longicorns*, we might eventually trace many of the transitional steps from the habit of simply burrowing in the trunk to that of the grub severing the twig; and thence, to the still more abnormal one of the parent insect performing the operation.

But a worse part of the above argument is in the implied assumption, made too frequently elsewhere, that the Creator could not have developed an instinct; the only reason for this assumption being, that we do not easily see how He could have accomplished it! It is no consolation to the true naturalist to be told, "Well, after all, the view that the 'girdlers' were, from the first, created with this instinct is the simplest and most comprehensible one!" He is not in search of easily enunciated doctrines, but of the truth; he looks upon any misconception and misstatement regarding the causation of the phenomena of Nature, as tending to lessen the high opinion we should form of the wisdom of its Author; and, while he does not conceitedly hope to be able to fathom every detail of a scheme that is universal, he does try to comprehend as much as he may of the invariable laws that control it. To such an one, these "girdlers" are not merely passing wonders, but elements in the study of the great problem of life.

Curious Sleepers.

Sleep is nearly as great a puzzle as ever it was. Much has been discovered concerning the bodily peculiarities manifested during this portion of our existence; but all whose opinions are best worth listening to, admit that they are only on the threshold of the subject yet. Why, for instance, can some men maintain their bodily and mental vigor with so small an amount of sleep as falls to their share? Lord Brougham, and many other great statesmen and lawyers, are known to have been content with a marvelously small quantity of sleep. Frederick the Great is said to have allowed himself only five hours; John Hunter, five hours; General Elliot, the hero of Gibraltar, four hours; while Wellington, during the Peninsular War, had still less.

How, on the other hand, to account for the cormorant sleepers? De Moivre, the mathematician, could (though it is to be hoped he did not) sleep twenty hours out of the twenty-four. Quin, the actor, sometimes slept for twenty-four hours at a stretch. Doctor Reid, the metaphysician, could so manage, that one potent meal, followed by one long and sound sleep, would last him for two days. Old Parr slept away his later days almost entirely. In the middle of the last century a young Frenchwoman, at Toulouse, had, for half a year, fits of lengthened sleep, varying from three to thirteen days each. About the same time, a girl, at Newcastle-on-Tyne, slept fourteen weeks without waking; and the waking process occupied three days to complete. Doctor Blanchet, of Paris, mentions the case of a lady who slept for twenty days together when she was about eighteen years of age, fifty when she was about twenty, and had nearly a whole year's sleep from Easter Sunday, 1862, till March, 1863; during this long sleep (which physicians call hysteric coma) she was fed with milk and soup, one of her front teeth being extracted to obtain an opening into her mouth. Stow, in his "Chronicle," tells us that "The 27th of April, 1546, being Tuesdaie in Easter weeke, W. Foxley, potmaker for the Mint in the Tower of London, fell asleep, and so continued sleeping, and could not be waked with pricking, cramping, or otherwise, till the first day of the next term, which was full fourteen dayes and fifteen nights. The causes of his thus sleeping could not be knowne, tho' the same were diligentlie searched for by the king's physicians and other learned men; yea, the king himselfe examined ye said W. Foxley, who was in all points found at his waking to be as if he had slept but one night."

Another very notable instance was that of Samuel Chilton, of Timsbury, recorded in one of the volumes of the "Philosophical Transactions of the Royal Society." In the year 1694 he slept for a month, and no one could wake him. Later in the same year he had a four month's sleep, from April the 9th to August the 7th; he woke, dressed, went out into the fields (where he worked as a laborer), and found his companions reaping the corn which he had helped to sow the day before his long nap; it was not till that moment that he knew of his sleep having exceeded the usual duration of a few hours. He went to sleep again on the 17th of August, and did not wake till the 19th of November, notwithstanding the pungent applications of hellebore and sal ammoniac to his nostrils, and bleeding to the extent of fourteen ounces. He woke, asked for bread and cheese, but went off to sleep again before it could be brought to him, taking another spell of sleep, which lasted till the end of January. After this it is not recorded that he had any more of these strange relapses.

There are instances of sleep so intensely deep as to deprive the sleeper of all sense of pain. The records of the Bristol Infirmary present an extraordinary illustration of this. One cold night a tramp lay down near the warmth of a limekiln, and went to sleep. One foot must have been close to the fire hole of the kiln; for during the night the foot and ankle were so completely burned away, as to leave nothing but black cinder and calcined ash. He did not wake till the kiln man roused him next morning, nor did he know what had occurred until he looked down at his charred stump. He died in the infirmary a fortnight afterwards.

IF we have an undue increase of noxious insects, it is not because new ones spring into being, but because of the increase of food on which they can feed. That the Colorado potato beetle is to some extent poisonous is inferred from the fact that the exposed parts of persons become very much swollen after standing in the smoke of fires into which these insects are thrown.

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Correspondence.

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Australian Timber---A Variety of Questions Asked

To the Editor of the Scientific American:

The lumber most used in this colony is that called Swan River mahogany, or, as the natives call it, Jarrah; this timber is most peculiar in almost every sense, and appears to be different from every other variety. It grows where you would think it almost impossible for anything to grow, namely, on the Darling range of hills, which range consists almost entirely of cemented gravel, commonly called ironstone. The higher the hill and the more stony the land, the larger and better the timber grows, the roots frequently raising up large masses of the above mentioned cemented gravel, several feet high, as the tree grows. The tree itself belongs to the *Eucalyptus* family, which predominates in all the Australian colonies, and is variously known as Stringy Bark, Iron Bark, Red White and Blue Gum, etc.

The timber of the Swan River mahogany is the next thing to everlasting; it is affected neither by fresh nor salt water, nor has any position on or in the ground any effect upon it; it is impervious to the white ant on land, and the *teredo navalis* in the sea, and no known insect will touch it. This is usually attributed to the peculiar geological formation of the land on which it grows. Houses and fences that were erected, and piles that were driven, when the colony was first settled, forty years ago, are as perfect now as when first put in position. It is largely used for jetties, piles, shipbuilding, railway sleepers, etc., but my great difficulty with it, and the point on which I am positive the SCIENTIFIC AMERICAN can give me good advice, is: How to prevent it from splitting? I believe it to be much more liable to split than most woods. It is generally agreed that the proper time to fell trees is in the winter, or when the tree is at rest. Now, in these Australian colonies, where there is, strictly speaking, no winter (frost and snow being unknown), all the trees are evergreens; the sap begins to flow and the tree to grow immediately after the rainy season sets in, which is about April or May. By June the tree is in full growth. September, October, and November are considered the spring, and December, January, and February the summer months, consequently March, April, and May are considered the autumn. Now, if we follow the practice of other countries, we should fell the timber in the wet season, which corresponds to the winter of most timber countries, but we find that the tree is growing then in full vigor, consequently it may reasonably be inferred that this is not the time to fell.

The information sought is what is the proper time to fell? and what is the best method of treatment after the timber is felled? Should the bark be left on, to exclude the effects of the hot sun and dry winds, or should it be removed to allow the sap to escape? To keep the logs under cover as they are cut is impracticable, except at very great expense. The questions are: Should the logs be covered with sawdust, earth, etc., at the ends, or not? Should the timber be cut up as soon as felled, or remain as felled for a given time?

In practice, we find that if any portion of the heart is left in the scantlings, they almost invariably split and rend in all directions, as if there were some substance in them, fermenting and causing them to burst. Another peculiarity is that no matter how long the lumber may have been in use or seasoning, if it be broken into, it is almost as full of sap and will shrink as much as when first felled.

The specific weight of the timber is 80 pounds per cubic foot; and consequently it sinks in water. It grows at an altitude of from 200 to 2,000 feet above the level of the sea. There is not more than half an inch of sap wood, and this is as durable as any part of the tree. The wood is most unequal in quality; some trees split ten times as much as others. So free is this timber at times that I have seen trees split from end to end, when they were felled, when full of sap. When a log is being broken down, or sawn down the center, I have seen it open at every stroke of the saw, as if the inside or heart wood were swelling or the outside wood contracting; so much so, that I have seen a log, when half sawn through, fly asunder. Professor Abel and others who have analyzed this wood attribute its peculiar properties to tannic acid.

Perth, Western Australia. WEST AUSTRALIAN.

Mechanical Equivalent for Zinc.

To the Editor of the Scientific American:

In your journal of the 24th of June, you assert that the "mechanical equivalent for twenty-two pounds of zinc, or the consumption of that quantity of zinc in such a manner that its total mechanical effect could be realized, would be a duty of two horse power maintained for nine hours." I am aware that it is the accepted formula of eminent scientists, and it is my purpose in this paper to prove that, as far as the researches of any public scientist are concerned, the world knows nothing about the mechanical equivalents of zinc, under combustion in a battery. Dr. Page, backed by eminent scientists, estimated three pounds of zinc to the horse power; Liebig, sixty four pounds.

Joule and Scoresby are capital experimentalists, and good orthodox authority, men who assert that the duty of electro-magnetic motors is as the quantity of zinc consumed in a given time. Well, they constructed such an engine, and found that one kind of battery consumed a third more zinc than another. A Daniell's battery uses seventy-five pounds, and a Grove's only fifty pounds, to do the same duty. Common sense might pertinently here enquire, if the different condition under which the zinc is consumed in the Grove battery gave it such an immense advantage over the Daniell, whether, in still other conditions, in some other battery, the quantity of zinc might not be still further reduced? The experiments of Joule and Scoresby, and also those of Jacobi and others, prove only that the work done is as the conditions under which the zinc is consumed, and not as to its quantity. This question of equivalents is, however, foreign to my purpose, and I will proceed to show, in a clear and unmistakable manner, that even three pounds of zinc is not requisite to the production of one horse power per day of twelve hours.

An electro-magnet, with limbs (one fifth of the area of the limb should be bored out) eight inches in length, and two inches diameter, bound with 1,100 feet of No. 14 wire, will lift fifty pounds at one tenth inch, under the action of four Bunsen eight inch cells. One hundred and twenty of these magnets, so arranged that their coils connect with a commutator making one revolution per second, will raise one hundred and twenty times fifty pounds one tenth inch high per minute, or 360,000 pounds one tenth inch high per minute, which, reduced to foot pounds, gives us a duty of 3,000, just one eleventh part of a horse power. Now, let us find the quantity of zinc consumed in the above duty. Four eight inch zincs, under the resistance of 1,100 feet No. 14 wire, will, in twelve hours lose just three ounces of their weight. We, therefore, have a dynamical value of one tenth of a horse power for a twelve hours, at a cost of three ounces of zinc, or one horse power for thirty-three ounces of zinc, three ounces less than three pounds. If it be alleged that such an arrangement of magnets is impractical for the continuation of motion, I reply that I am not now discussing the application of battery forces to purposes of motive power, but showing that the potential value of the battery has been extremely underrated.

In a future communication, I will as clearly show that the battery cost has had nothing to do with the non-success of electro-magnetic motors; that if the electric currents were generated absolutely costless, they never would have been more than a large toy. H. M. PAINE.

Peter Cooper's Success in Life.

To the Editor of the Scientific American:

I wish to say a word in relation to an expression in Mr. Peter Cooper's address and your comments.

No person not personally acquainted with Mr. Cooper, can, I think, regard him more highly than myself. The name of Peter Cooper can never be adorned or honored by any title or appendage. Of itself it stands alone, the most honorable name in the land.

But you say, "he shows how to earn a fortune," etc., and quote his words, that "whatever of wealth I have achieved has been due primarily to habits of patient industry."

Now, while the value of these virtues cannot be overestimated, it is a fact, nevertheless, that very many men have been as earnest, as industrious, as economical, and as patient as Mr. Cooper, but have no, like him, won a "fortune." Beside possessing and practising these virtues, he has been endowed with a keen business sagacity, a quality entirely independent of the former. He has also been fortunate; that is to say, circumstances over which he had no control, have favored him. The necessary elements of financial success include much more than "patient industry, integrity, and economy;" and it is the knowledge of this fact which leads so many to resort to questionable practices to make a "fortune;" seeing as they do, that while the practice of these virtues will get a man a "living," it will not, of necessity, make him "rich;" and also seeing numerous examples where large fortunes have been made by corruption and deception.

"Shunning intemperance, and practicing rigid economy," have been among the means by which this noble man has won the proud position which he occupies; but they are not the only ones. In a case like this, I think no other statement but the exact truth, is safe in the long run, and therefore it is that I wish to suggest that young men should understand that while the practice of these virtues will secure to them that which is more valuable than gold, it will not necessarily bring them the pecuniary success which has attended Mr. Cooper.

BETA.

How to Look at the Sun through a Telescope.

To the Editor of the Scientific American:

Take a good telescope, and cover the larger glass with a paper cover similar to the brass cover used to protect the glass. Pierce this paper cover with innumerable small needle holes, or with a ring of small holes. Unprotected, you cannot look at the sun, but with this protection, you will see the sun as a large white disk—sometimes a full disk, at others as a phase—accompanied by two sets of colored rings, which assume, during the different hours of the day, different combinations.

If you observe the sun at sunset, neither of those rings or disks appears, but the sun vibrates and follows a straight linear horizontal or vertical course.

Happening to look through the glass in the evening, at a stockade of posts some six inches apart, those posts appeared some six feet apart. If you puncture a straight line on paper with needle holes, and look at two posts of equal hight, using both your eyes, one post will appear much shorter than the other.

By using an opera glass, no rings appear; but the sun seems to move around a ring, if we provide both glasses with the pierced paper covers mentioned.

Why does the sun show different phases and rings at different hours, and why does it roll or drop at near sunset? Also, why does it, when looked at through the glass, set some five minutes sooner than when seen without the glass?

Missouri, Montana. A. H.

Paine's Perpetual Motion.

"*Qui prouve trop ne prouve rien.*"

To the Editor of the Scientific American:

The object of this communication is to prove that if H. M. Paine's assertion (see his letter, page 404, No. 26, last volume) that the mechanical equivalent of the electricity, developed by the oxidation of 3 grains of zinc, is equivalent to 67,000,000 foot pounds, be correct, he has found perpetual motion, and even more than that, and that it is no use for him to deny this.

It is known to all electricians that we possess the means of developing electric currents by purely mechanical power; for instance, the old friction machine, the modern Holz induction machine, and the different kinds of magneto-electric apparatus first made by Pixis, Clarke, Ettinghausen, and since considerably improved by Siemens, Stoerer, and others. The latter kind have the advantage of giving currents of great quantity, even superseding batteries in telegraphing, while the first named give only intensity. The magneto-electric machines, therefore, give currents similar to those of the ordinary batteries of zinc and acids; this has been fully established by the practical results obtained by the large machines of this day. These results are of three kinds: First, in regard to the production of heat and light; second, in regard to chemical action; and third, in regard to electro-magnetic attraction.

1st. PRODUCTION OF HEAT AND LIGHT.—A beacon at South Foreland, England, is illuminated by means of a magneto-electric machine, rotated by a small steam engine of two horse power. It produces a light equal to that of fifty Bunsen cells, 6 by 4 in. plates, consuming each half an ounce of zinc per hour, with the necessary acids.

A few years ago, the Place du Carrousel and the Jardin des Tuileries in Paris, were illuminated at night with three electric lights (Dubosq's lamps) produced by a magneto-electric machine driven by a steam engine of four horse power. Its cost was half that of common street gas, while the equivalent battery, of fifty large Bunsen cups, consuming three pounds of zinc, three pounds of sulphuric, and two pounds of nitric acid per hour, would cost considerably more.

Quite recently a French government vessel, provided with such an apparatus, exhibited in our harbor an electric light, produced by steam power; it was placed at the bow of the vessel, in place of the ordinary lanterns, on which it was an immense improvement.

2d. PRODUCTION OF CHEMICAL ACTION.—Some years ago a company was formed in New York by a certain Mr. Shephard, to electroplate, by means of a magneto-electric machine driven by steam power. It was seen in operation at the fairs, and fine specimens of electroplating and electrotyping were produced. It was based on the fact that it is economical to replace the consumption of zinc in the battery, by that of the cheaper coal in the furnace; but the company was, financially, mismanaged, as is so often the case in companies. Another trouble was, that the machines were constructed in total ignorance of certain peculiar laws of magneto-electric induction, and manipulated by persons who could by no means be called electrician, of which I satisfied myself by personal investigation.

A permanent success was attained at College Point, L. I., at the india rubber works of Mr. Poppenhusen, who had several magneto-electric machines, constructed after the patented plans of Mr. Beardslee, running by steam power; he had for many years a successful electroplating establishment in operation, or rather he rented out electric currents to an electroplating firm of New York city, in the same way as it is customary to rent out steam power. I visited this establishment often, and a great saving of expense, by the substitution of steam power for the consumption of zinc and acids, was the result. I believe that the process is no more in use at present, as an ordinary steam engine gives much more battery power than the largest electroplating establishment can make use of; perhaps also for reason of the difficulty of subdividing a powerful current properly between the different electroplating troughs, for which purpose different smaller zinc batteries are more easily adjusted.

3d. PRODUCTION OF MAGNETIC ATTRACTION.—In regard to the magnetic force of the thus produced electric currents, I can state that Mr. Beardslee occupied himself with manufacturing magnetic hammers, horseshoe magnets, magnetic toys, also magneto-electric rotary machines, and field telegraphs, in all of which it was necessary to obtain a strong magnetic power; and that all of this, he obtained in immense quantities from colossal soft iron systems, surrounded by coils, and solely charged by the currents produced in the magneto-electric machine by the power of the steam engine rotating the same. He saved in this way several hundred times the 3 grains of zinc Mr. Paine speaks of, while employing only about the hundredth part of the 67,000,000 foot pounds which Mr. Paine asserts that he can obtain from the 3 grains of zinc.

I have avoided theoretical reasonings for the simple reason that, according to Mr. Paine, the theory is all wrong; and I confined myself to purely practical results, to stubborn facts; and among those bearing especially on our subject, I selected only a few obtained in our city and neighborhood. They may be multiplied *ad infinitum*, and they all show that, independent of any theories, we may, by using mechanical power, develop electric currents equivalent, to all intents and purposes, to the currents developed by the consumption of zinc. These machines are coming more and more in use, one of the latest, that of Wilde, which was an improvement on Ladd's, obtained a prize at the Paris Exposition of 1867; while S. Marcus, in Vienna, now manufactures magneto-electric machines equal to a Bunsen cell consuming 500 grains of zinc per hour, and in which the current is developed by the power of a man only. A large magneto-electric machine

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needs not even to be of the most improved kind in order to produce, by means of a single horse power, not only the same but much stronger currents than those which Mr. Paine asserts to be sufficient "to drive the largest ship afloat."

I propose, therefore, that Mr. Paine will use one thousand part of his 67,000,000 foot pounds obtained from the 3 grains of zinc, or 67,000 foot pounds (if used in one minute it is nearly two horse power), and employ this to run some large magneto-electric machine, producing thus a current equivalent to that obtained by the consumption of three pounds, or nearly 23,000 grains of zinc per hour, and therefore not only equal but much stronger than that originally obtained from merely 3 grains of zinc, which then may afterward be dispensed with; the stronger current thus obtained again acting on Paine's electric engine will cause it to run much faster than could be done with the 3 grains of zinc used at the starting; this faster motion again acting on the magneto-electric machine will, of course, cause a stronger current (the strength of the currents, as well known, increases in these machines with the velocity of rotation), this stronger current will again cause Paine's electro-motor to run faster, and so on, and so on; consequently he has not only obtained perpetual motion—no, "instead of this miserable small result," he will have obtained a motion possessing in itself the elements of a creative increase, so as finally to obtain "a velocity only limited by the strength of the frame of the" machine.

Mr. Paine says: "I am no tyro." The public is aware of this; but when he adds: "I am the peer of any authority you may quote," it gives a suspicion that after all he is not thoroughly acquainted with the investigations in electro-magnetism of Casselman, Bunsen, Joule, Wiedemann, and, above all, Dubb, the labors of all of whom are immense, and of much more special importance to the subject in question (electromagnetic motive power) than those of the authorities he quotes. Their investigations relate chiefly to the subject of the correlation of forces in general. Only Faraday stands among them as a great discoverer in electrical science. I ask: What is proved by the fact that Mr. Paine calls himself the peer of a man like Faraday? If it does prove anything at all, it surely does not prove his assertions. Drive your large ship, Mr. Paine, and leave it to others to call you "the peer of any man of science;" or, what is better still (as it would in a short time make you richer than Commodore Vanderbilt or A. T. Stewart), I advise you, if you are so sure of success, to manufacture small electro-magnetic engines, producing 67,000,000 foot pounds per day, at the expense of three grains of zinc; this would be equivalent to about 20 horse power, at an expense of two ounces of zinc per year costing, with the acids, from two to three cents per year, in place of about $1,000 for coal, and more than $1,000 for labor, as is now the case; do this, Mr. Paine, such machines would sell, drive all steam engines out of the market, and your fortune is made, which is much better than fighting the old theory of the conservation of forces, or of bothering yourself and the public with blowing about what you are going to do.

I recommend to all others interested in this subject to study the labors of Casselman in regard to the unit of chemical intensity of the galvanic current, then the subsequent labor of Weber in regard to the unit of the absolute electro-magnetic effect as depending from the unit of chemical intensity, and the practical investigations of Dubb; when then applying all these to the laws of electro-dynamics, discovered long before by Ampère, the matter becomes settled. I came long ago to a final conviction in regard to the subject, after having studied it practically as well as theoretically, from the year 1837 (I had already, in 1839, an electromagnetic motor in operation, turning my lathe).

Mr. Paine says the gentlemen associated with him in this enterprise suppose that they are "fully competent to judge of the facts in the premises," and that they "are men that you nor I cannot mislead."

Well, in the recent Franco-German war, Napoleon III., his generals, and the French people at their back, were satisfied that they were fully competent to judge for themselves, that they could whip the Prussians, and would never have abandoned the idea without practical trial; and I believe that Mr. Paine and "the gentlemen associated with him" will have to go through the ordeal of a practical trial also, before their eyes can be opened to the truth. The only difference between them and the French is, that the latter had some chance of success, as the results of war depend, to a certain extent, on luck or good fortune, while for obtaining 67,000,000 foot pounds out of only 3 grains of zinc there is not a ghost of a chance.

The unfortunate thing in all this and similar cases is that the denial of an anticipated success does not pay, while the stubborn assertion of an ultimate triumph, may be made to pay, when a man is no tyro, and only knows how.

New York city. P. H. VANDER WEYDE, M.D.

Humboldt.

Alexander von Humboldt was the corypheus of physical science and a man of universal culture; a man also, of "society," and of courtly life. He kept up his intellectual work to the last, laboring mostly while the world around him slept. It was his most substantial life. He lived about ninety years, and crowded into them centuries of the life and work of ordinary men. On the 3d of May, 1859, the journals of Berlin announced that "Alexander von Humboldt has been confined to his bed the last twelve days; his strength has been gradually failing; his mind retains all its clearness." In three days more as the sunlight poured into his window, he exclaimed, "How grand those rays! they seem to beckon earth to heaven!" and died. For twenty years or more, the time in which men are usually said to be beyond the "allotted period of life," and during which they usually mentally decay from day to day, he was writing the greatest work of his life, the greatest of his generation, the "Cosmos." He laid down his pen, his task splendidly finished, but a short time before he laid himself down to die. The "Cosmos" kept him alive, mentally and physically.

Brain work is sanitary work. Nay, it is a necessary condition, more or less of it, of health in advanced life, a necessary preventive of cerebral decay. Not only moral purification, but growth in intelligence, in wisdom, is the divinely appointed result of human life as a probation; and nature deals out her penalties for the neglect of the latter, as well as for the neglect of the former.—*Abel Stevens, in Hearth and Home.*

Dream Workers.

Those cases in which the brain is hard at work during sleep, instead of being totally oblivious of everything, may be called either dreaming or somnambulism, according to the mode in which the activity displays itself. Many of them are full of interest. Some men have done really hard mental work while asleep. Condorcet finished a train of calculations in his sleep which had much puzzled him during the day. In 1856, a collegian noticed the peculiarities of a fellow student who was rather stupid than otherwise during his waking hours, but who got through some excellent work in geometry and algebra during sleep. Condillac and Franklin both worked correctly during some of their sleeping hours.

The work done partakes in many cases more of the nature of imaginative composition than of scientific calculation. Thus, a stanza of excellent verse is in print, which Sir John Herschel is said to have composed while asleep, and to have recollected when he awoke. Goethe often set down on paper during the day, thoughts and ideas which had presen ed themselves to him during sleep on the preceding night. A gentleman one night dreamed that he was playing an entirely new game of cards with three friends; when he awoke, the structure and rules of the new game, as created in the dream, came one by one into his memory; and he found them so ingenious that he afterwards frequently played the game. Coleridge is said to have composed his fragment of Kubla Khan during sleep. He had one evening been reading Purchas's Pilgrim; some of the romantic incidents struck his fancy; he went to sleep, and his busy brain composed Kubla Khan. When he awoke in the morning he wrote out what his mind had invented in sleep, until interrupted by a visitor, with whom he conversed for an hour on business matters; but alas! he could never again recall the thread of the story, and Kubla Khan remains a fragment. Doctor Good mentions the case of a gentleman who in his sleep composed an ode in six stanzas, and set it to music. Tartini, the celebrated Italian violinist, one night dreamed that the devil appeared to him, challenged him to a trial of skill on the fiddle and played a pi ce wonderful for its beauty and difficulty; when Tartini woke, he could not remember the exact notes, but he could reproduce the general character of the music, which he did, in a composition ever since known as the Devil's Sonata. Lord Thurlow, when a youth at college, found himself one evening unable to finish a piece of Latin composition which he had undertaken; he went to bed full of the the subject, fell asleep, finished his Latin in his sleep, remembered it next morning, and was complimented on the felicitous form which it presented.

Still more curious, however, are those instances in which the sleeper, after composing or speculating, gets up in a state of somnambulism, writes the words on paper, goes to bed and to sleep again, and knows nothing about it when he wakes. Such cases, the authenticity of which is beyond dispute, point to an activity of muscles as well as of brain, and to a correctness of movement which is marvellous when we consider that the eyes are generally closed under these circumstances.

Dr. W. B. Carpenter mentions the case of a somnambulist who sat down and wrote with the utmost regularity and uniformity. "Not only were the lines well written, and at the popular distances, but the i's were dotted and the t's crossed; and in one instance the writer went back half a line to make a correction, crossing off a word, and writing another above it, with as much caution as if he had been guided by vision." The young collegian, adverted to in a former paragraph, got out of bed in his sleep, lit a candle, sat down to a table, wrote his geometry and algebra, extinguished the light, and went to bed again; the lighting of the candle was a mere effect of habit, for his eyes were shut and he was really not awake. About the begining of the present century a banker at Amsterdam requested Professor van Swinden to solve for him a calculation of a peculiar and difficult kind. The professor tried it, failed, and submitted to ten of his pupils as a good mathematical exercise. One of them, after two or three days work at it, went to bed one night with his mind full of the subject, and fell asleep. On waking in the morning he was astonished to find on his table sheets of paper containing the full working out of the problem in his own handwriting; he had got up in the night and done it, in his sleep and in the dark. The first French Encyclopædia narrated the case of a young ecclesiastic at Bordeaux who was in the habit of getting out of bed in his sleep, going to a table, taking writing materials, and writing a sermon. He was often watched while doing this, and an opaque screen was cautiously placed between his eyes and the paper; but he wrote on just the same. One example of mental discrimination displayed by him was very remarkable, showing how strangely awake even the reasoning faculties may be during somnambulistic sleep. He wrote the three French words, "ce divin enfant;" then changed the "divin" into "adorable;" then recognized that "ce" would not suit before an adjective commencing with a vowel; and finally changed it into "cet." On another occasion the paper on which he was writing was taken away and another sheet substituted; but he immediately perceived the change. On a third occasion he was writing music, with words underneath. The words were in rather too large a character, insomuch that the respective syllables did not stand under their proper notes. He perceived the error, blotted out the part, and wrote it carefully again; and all this without real vision, such as we ordinarily understand by the term.

The Irrational House.

A house is as much a necessary of life as a loaf; yet this article of necessity has been lately raised to a fancy price by the trade conspiracies of the building operatives—not so much by their legitimate strikes for high wages as by their conspiring never to do for any amount of wages an honest day's work—and the fancy price thus created, strikes the householder first in the form of rent. But this excessive rent, although it is an outgoing, is taxed as income; its figure is made the basis of all the imperial and parochial exactions that crush the householder. One of these is singularly unfair; I mean "the inhabited house duty." What is this but the property tax rebaptized and levied over again, but from the wrong person? The property tax is a percentage on the rent, levied in good faith, from the person whom the rent enables to pay that percentage; but the inhabited house duty, is a similar percentage on the rent, levied, under the disguise of another name, from him whom the rent disables.

In London the householder constantly builds and improves the freehold: instantly parochial spies raise his rates. He has employed labor, and so far counterbalanced pauperism; at the end of his lease the house will bear a heavier burden; but these heartless extortioners cannot wait the end of the lease; they bleed the poor wretch directly for improving parochial property at his own expense. At the end of his lease the rent is raised by the landlord on account of these taxed improvements, and the tenant turned out with a heavier grievance than the Irish farmer; yet he does not tumble his landlord, nor even a brace of vestrymen. The improving tenant, while awaiting the punishment of virtue, spends twenty times as much money in pipes as the water companies do, yet he has to pay them for water a price so enormous that they ought to bring it into his cisterns, and indeed into his mouth, for the money.

He pays through the nose for gas.

He bleeds for the vices of the working classes; since in our wealthy cities nine tenths of the pauperism is simply waste and inebrity. He often pays temporary relief to an improvident workman, whose annual income exceeds his own, but who will never put by a shilling for a slack time.

In short, the respectable householder of moderate means is so ground down and oppressed that, to my knowledge, he is on the road to despondency and ripening for a revolution

Now, I can hold him out no hope of relief from existing taxation; but his intolerable burden can be lightened by oth er means; the simplest is to keep down his bill for repairs and decorations, which at present is made monstrous by original misconstruction.

The irrational house is an animal with its mouth always open.

This need not be. It arises from causes most of which are removable—namely, 1st, from unscientific construction; 2nd, plaster ceilings; the want of provision for partial wear; 4th, the abuse of paint; 5th, hidden work.

Under all these heads I have already given examples. I will add another under head 3. The dado or skirting board is to keep furniture from marking the wall; but it is laid down only one inch thick, whereas the top of a chair overlaps the bottom an inch and a half. This the builders do not or will not observe, so every year in London fifty thousand rooms are spoiled by the marks of c.air backs on the walls, and the owners driven to the expense of painting or paper ing sixty square yards to clean a space that is less than a square foot, but fatal to the appearance of the room.

Under head 4 let me observe that God's woods are all very beautiful; that only fools are wiser than God Almighty; that varnish shows up the beauty of those woods, and adds a gloss; and that house paint hides their beauty. Paint holds dirt and does not wash well; varnish does. Paint can only be mixed by a workman. Varnish is sold fit to put on. Paint soon requires revival, and the old paint must be rubbed off at a great expense, and two new coats put on. Varnish stands good for years, and when it requires revival, little more is necessary than simple cleaning, and one fresh coat, which a servant or any body can lay on. 5. Hidden work is sure to be bad work, and so need repairs, especially in a roof, that sore tried part; and the repairs are the more expensive that the weak place has to be groped for.

I have now, I trust, said enough to awaken a few householders from the lethargy of despair, and to set them thinking a little, and organizing a defense against the extraordinary mixture of stupidity and low instinctive trade cunning of which they are the victims; for a gentleman's blunders hurt himself, but a tradesman's blunders always hurt his customer; and this is singularly true of builders' blunders; they all tend one way—to compel the house holder to be sending for the builder, to grope for his hidden work, or botch his bad work, or clean his unscientific windows, or whitewash his idiotic ceilings, or rub his nasty unguents off God's beautiful wood, and then put some more nasty odoriferous unguents on, or put cowls on his illcleaned chimneys; or, in short, to repair his countless blunders at the expense of his customer.

Independently of the murderous and constant expense, the bare entrance into a modest household of that loose, lazy, drunken, dishonest personage who has the impudence to call himself "the British workman," though he never did half a day's real work at a stretch in all his life, is a serious calamity to be averted by every lawful means.—*Charles Reade.*

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Improved King Bolt for Carriages.

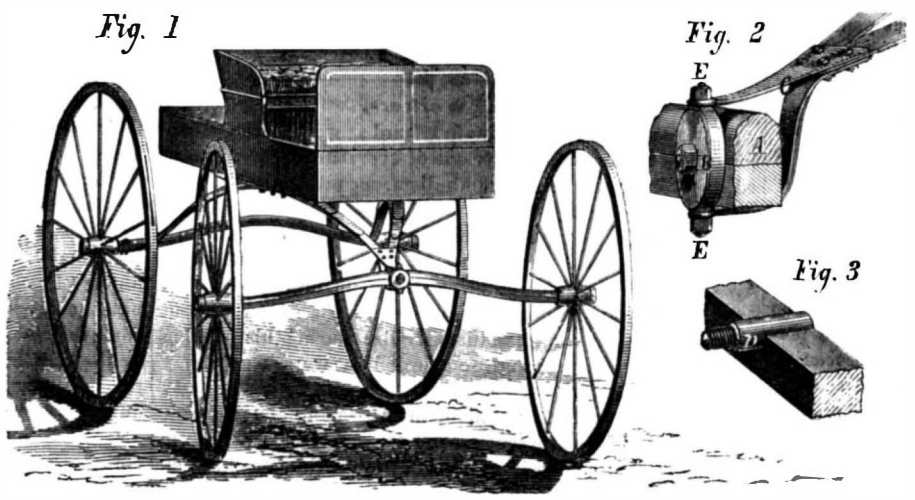
Our engraving shows an improved king bolt for carriages. By its use, the necessity for a fifth wheel, and many other attachments, is entirely obviated.

Fig. 1 is a perspective view of a buggy wagon with this improvement attached. Fig. 2 is a vertical cross section through the middle of the axle and the bolt; and Fig. 3 is a detail rear view of the middle of the axle.

In Fig. 2 the improvement is shown most distinctly. The body of the wagon rests upon two elliptic springs, placed lengthwise under the box, their front ends being brought together and joined, as shown at C, Fig. 2, forming what might be called a spring perch.

A bent piece is attached to the joined ends of the springs, and brought under the axle as shown. The bifurcations of the perch thus formed are pivoted to a plate, B, as shown at E. The plate, B, is also pivoted to the axle, A, as shown in Figs. 2 and 3. This not only allows of the horizontal radial motion of the axle in turning or cramping the wagon, but also permits a vertical motion of the axle on the pivot, D.

This improvement was patented through through the Scientific American Patent Agency, March 29, 1870, by William Clark. Address, for further information, Clark Pivot King Bolt Co., Johnsville, N. Y.



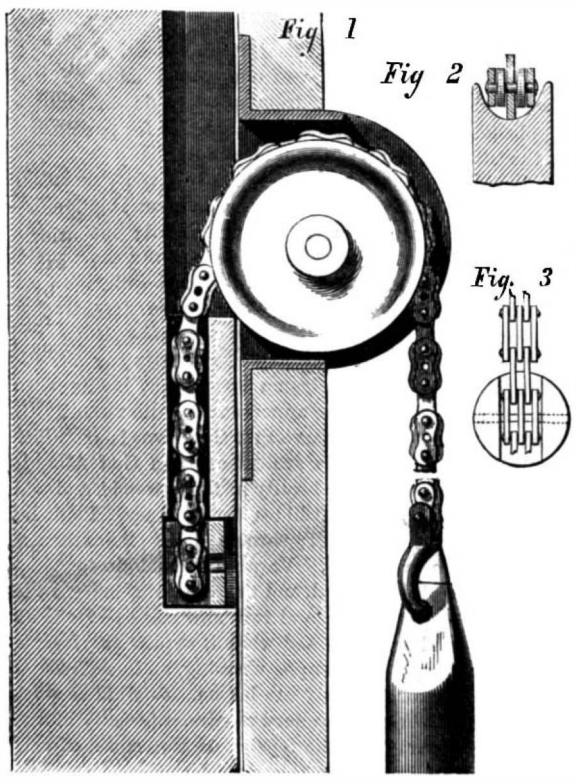
CLARK'S KING BOLT FOR CARRIAGES.

MAGRATH'S CHAIN FOR HANGING SASHES.

Every housekeeper knows the trouble attending the use of hemp cord for suspending weights of sashes. A chain, as a substitute for the ordinary cord, has recently been patented, which is designed to obviate the trouble arising from the constant breaking of the latter. The chain can be applied to any window, without change in any of the parts, it being so made as to run smoothly on the ordinary grooved pulley. For heavy windows it is specially applicable.

Fig. 1 is a view of a sash with chain and weight attached. The peculiar construction of the chain is shown in the detailed engravings, Figs. 2 and 3. As will be seen, every alternate link is composed of three blanks, punched from sheet metal. Each blank has a hole through the center, as well as at the extremities. The object of this is to enable the chain to be cut off at any required length, and be readily fastened, at one end to the sash and at the other end to the weight, by the insertion of a pin or rivet.

The triple blank links are connected by links made of two blanks, as shown. The middle blank of each triple link is made wider than the two outside ones, as shown in Fig. 3. This enables the link to adapt itself to the curvature of the groove in the pulley, as shown.



In attaching this chain to the sash, the latter is grooved or recessed along the edge, as shown in Fig. 1, so as to receive the chain. At the lower end of the groove is formed a vertical hole, which extends from the open groove down to a hole bored in the edge of the sash at right angles thereto. A metal plug or stop, of a size to fit the last named hole, is inserted therein. This stop is recessed on its face to receive the links, as shown in Fig. 2. The chain is secured to the stop by a rivet or pin, as shown in Fig. 1. The weight is attached to the end of the chain by a hook.

Patented, March 21, 1871, by Michael Magrath, whom address for further information, 74 Irving Place, N. Y.

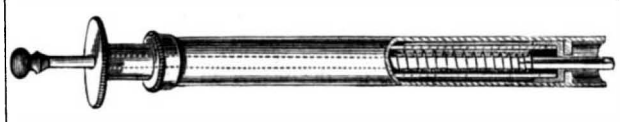
Steam Nut Crackers.

In the manufacture of palm oil, it has been very desirable to get rid of the shells which envelop the kernels in a speedy and effective manner. An English inventor proposes to do this by an apparatus of his devising, as follows:

The nuts are raised up to the second floor of the building by means of hoisting apparatus, and are fed into a hopper, which delivers them into a shake or spout, the bottom of which is perforated to allow parts of the husks or other foreign matters to escape. The spout delivers the nuts into the upper end of a revolving perforated cylinder, which is placed in a slanting position. The nuts in passing down this cylinder are agitated to remove portions of the husks and other foreign matters, which are carried off by the shoot. The nuts drop from the end of the cylinder into a hopper, which delivers them to the machinery by which they are broken. This machinery consists of a drum with blades or projections on its circumference. This drum revolves at a high velocity in a casing, and the shells are broken without breaking the kernels by the rapid action of the blades on the revolving drum striking the nuts. The broken shells and kernels discharged by the centrifugal force of the drum are delivered into the upper end of a perforated cylinder, which is also placed in a slanting position, so that in revolving it carries the shell and kernels to the lower end, whence they fall into a separating cistern. The small particles of shell and husk drop through the perforations of the cylinder into a discharge shoot. The cistern contains a solution of common salt and water, or any other solution the specific gravity of which is rather greater than that of water, in order that the kernels may float on the top of the solution, while the shells sink and drop on to an endless belt or creeper, which in traveling along conveys the broken shells towards and into the right hand end of the cistern, from whence they are discharged continuously by a spout. The outlet from the cistern is provided with a sliding valve, the position of which can be regulated by a lever. The lower part of the spout consists of open rods or a perforated plate, through which the solution escaping from the cistern with the broken shells is discharged on to the floor or into a suitable receptacle.

ARTIFICIAL LEECH.

This instrument is the invention of Frederick Wolff, of New York city. It consists of a lancet, or puncturing device, and a suction piston, the lancet acting independently of the



piston in making its puncture, and then both the lancet and piston being withdrawn, the body of the instrument is filled with blood. The instrument operates precisely on the general principle of first puncturing and then sucking, employed by the natural leech.

Disease and Carelessness.

There can be no doubt that carelessness is the origin of most diseases. Medical men also hold that foolish people who follow their own whims have hardly a chance of recovery when visited by serious disease. Nine tenths of the doctor's work would be done if people were only consistently prudent and cautious. Only it is so hard to be habitually cautious. On abundant occasions a man may be most elaborately prudent, and then, to his utter astonishment, he dangerously imperils his health by some startling impropriety. When he has used every imaginable pains, he is always amenable to the force of accident. There is another plausible theory, antagonistic to the one we have named, to the effect that every man has the seeds of some particular disease in his constitution, and some trifling accident will come, sooner or later, which will have for him the same effect as a match falling upon gunpowder.

Medical men explain this on theories of constitutional tendencies, or of some poison latent in the system. The fatal accident to one man is the merest accident for another. Two men while walking get well soaked by the rain. One man shakes off the water pretty much as a dog or a duck might do, and rather enjoys his shower bath than not. The other man is taken ill of inflammation of the lungs, and probably dies. The doctors cannot explain the different issues, and they would also be very much puzzled to give a satisfactory account of the phenomenon itself. They will, indeed, generally explain theories more or less plausible, and practice has been built upon theory, and theory has, no doubt, sacrificed a number of lives. Yet medicine must have its dogmatic system, and without it medicine becomes little better than empiricism.

COMMON salt is recommended for the extermination of ants.

Subterranean Electrical Disturbances.

A few minutes before and after the earthquakes of the 17th March last, says *Nature*, powerful positive electrical currents were rushing towards England through the two Anglo-American telegraph cables, which are broken near Trinity Bay, Newfoundland. Mr. C. F. Varley, C.E., who informed us of the fact, broaches the novel speculation that some earthquakes may be due to subterranean lightning. He imagines that as the hot center of the earth is approached, a layer of hot dried rock may be found which is an insulator, while the red hot mass lower down is a conductor. If this conjecture be true—and there is plausibility in it—then the world itself is an enormous Leyden jar, which only requires charging to a very moderate degree to be equal to the production of terrific explosive discharges.

The French Atlantic cable was disturbed at the same time, and so were many of the English land lines, but the only observations as to the direction of the current were made by means of the Anglo-American telegraph cables.

A number of Mr. Varley's charts about earth currents were published in the Government Blue Book of 1859–60, showing that the direction of these currents across England was in a very notable degree determined by the contour of the coast, and that the same auroral discharges would often produce currents at right angles to each other in direction, in different parts of Britain.

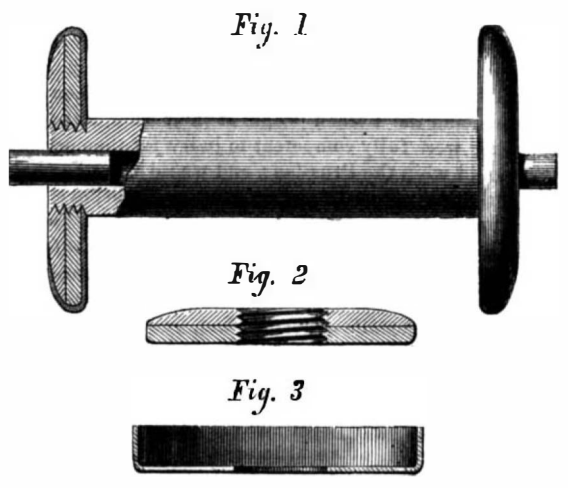
Necessary Rules for Sleep.

There is no fact more clearly established in the physiology of man than this, that the brain expends its energies and itself during the hours of wakefulness, and that these are recuperated during sleep. If the recuperation does not equal the expenditure, the brain withers—this is insanity. Thus it is that, in early English history, persons who were condemned to death by being prevented from sleeping, always died raving maniacs; thus it is also that those who are starved to death become insane, the brain is not nourished and they cannot sleep.

The practical inferences are three: 1st. Those who think most, who do the most brain work, require the most sleep. 2d. The time "saved" from necessary sleep is infallibly destructive to mind, body, and estate. 3d. Give yourself, your children, your servants, give all that are under you, the fullest amount of sleep they will take, by compelling them to go to bed at some regular, early hour, and to rise in the morning the moment they wake; and within a fortnight, Nature, with almost the regularity of the rising sun, will unloose the bonds of sleep the moment enough repose has been secured for the wants of the system. This is the only safe and efficient rule; and as to the question how much sleep any one requires, each must be a rule for himself—great Nature will never fail to write it out to the observer under the regulation just given.

METALLIC LINED SPOOL HEAD.

The object of this improvement is to overcome the difficulties experienced in the use of the ordinary wood spool heads, both for cotton yarn, and woolen roving on jack spools. The wood heads, after being used a short time, become rough on the edge, and this roughness catches and breaks the yarn, causing much unnecessary stopping of machinery. On jack



spools, much waste is made by the outside strands of the roving adhering to the surface of the head, and it is frequently the case that the strands next to the head have to be run off, and cannot be spun, making considerable waste which would be saved by the use of a smooth head, such as this improvement offers. It consists in covering the inner surface and outer edge of each head with sheet metal, which is firmly pressed on with dies, binding the two thicknesses of wood firmly together, preventing them from breaking and the edges from splintering, making a strong and durable spool, and giving at all times a perfectly smooth edge and surface for the yarn to run from, saving much of the breaking of the yarn, and enabling the machines to do more and better work. They have, we are informed, been in successful use nearly one year, by some of the first manufacturers in the country, and have given entire satisfaction. Patented May 10, 1870. All communications, either from manufacturers or spool makers, should be addressed to Stillman & Carmichel, Westerly, R. I.

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COLLEGE COMMENCEMENTS.

It is estimated that there are two hundred and twenty-five colleges, for males, in the United States, entitled to confer degrees, and that the total attendance upon them, of undergraduate students of arts, is, in round numbers, 14,000. This will allow one student to every 2,850 of the population; and as one quarter of the students leave every year, we have at the annual commencements the picture of 3,500 young men presenting themselves for the degree of Bachelor of Arts from all of our Colleges. This is a pretty large army of recruits to be admitted each year to the ranks of college alumni, and if classical education is what it is represented to be, the young men ought to exert a controlling influence over the affairs of the nation.

There is no doubt that college graduates are to be found in the highest positions of our land. The leading clergymen, physicians, lawyers, and statesmen are taken from the ranks of college alumni; and there appears to be something in the training which they have received that gives them an advantage over their competitors. There are, however, in our country, numerous instances of self-made men who, by extraordinary intensity and peculiar natural gifts, have surmounted the disadvantages of defective early training, and have risen to the highest eminence. These instances are rare and cannot be quoted as an argument against the advantages of college training.

Any reflecting man must observe that, of late years, a larger proportion of the so-called self-made men rise to prominent positions than formerly. A peculiar kind of talent is required to secure an ascendancy in politics. And our modern rulers cannot afford to waste time on the finer points of education if they expect to attain early success in the possession of office. We find college graduates pushed aside and intriguing men of inferior training accepted in their places. So many instances of this kind have occurred lately that it is said that the total number of students attending colleges in the United States is not relatively but absolutely less than it was thirty years ago; in other words, although the population of the country has largely increased, the attendance upon colleges has either remained stationary or has actually diminished. While at one time in our history there was one person in every thousand in college, we now find only one person in nearly three thousand. The average is said to be brought down by the great influx of foreigners, but it cannot be looked upon as an encouraging sign of the times. It is not safe for our colleges to shield themselves under cover of foreign emigration, but they would do well to consider whether the decrease in attendance may not be partly due to defects in their curriculum of instruction. Perhaps the fathers who supply the money do not feel that they get their money's worth. This is a practical age, and people are very much in the habit of sitting down and counting the cost of an education; and if the investment does not yield a good return, they certainly will not make it.

Somehow, college education has grown into disrepute, and college professors would do well to inquire why. It is none of our business to answer questions of this character. We have to deal with the applications of science to the arts, and the patent diplomas which we procure for our customers are written in plain English, and do not require an interpreter; but we have some knowledge of the wants of the country, and we publish every week a list of inquiries from all parts of the United States, going to show what people want to know. We would suggest to college authorities the propriety of reading these questions, and also of studying the great demands of the age, and, after the perusal, let them ask themselves, how many of these inquiries could be answered by a college graduate? This would be a fair test to make, and it may possibly afford an explanation of the falling off in the attendance upon colleges. Perhaps the colleges do not offer the kind of education that the times demand. It may be that a little less Latin and Greek, and more of the physical sciences, would be acceptable. That we are correct in our surmise is proved by the fact that a large number of schools of science have been organized all over the land, and the attendance upon them will soon far exceed that upon the old fashioned institutions. Schools must keep up with the progress of the age, as well as inventions, and as the inventor who brings out something that nobody wants, necessarily fails, so the college which teaches what was fashionable in the middle ages, but is now utterly superseded, must also go down for want of patronage.

"There is a screw loose somewhere," to adapt a phrase taken from out our profession, and it ought to be secured. When our colleges are able to provide an education that will enable men to make better mechanics as well as clergymen, better merchants as well as lawyers, better farmers as well as doctors, they will come nearer to answering public demand than they now do; and, instead of having an attendance of 14,000, in a population of 40,000,000, they would soon run up the number to more than a hundred thousand, and be able to scatter the seeds of learning over the whole extent of our great nation.

The Commencement season is the occasion for the gathering together of the faithful all over the land. Let the Alumni this year consider some of the points raised by us, and we doubt not that much good may be made to grow out of the discussion.

THE CAUSES OF DISEASE.

The uncertainty of medical men as to the real value of the greater number of remedies which have been recommended and tried in all ages, for the cure of disease, has been due to ignorance of the causes of the various ills to which the animal economy is liable. We think it may be safely asserted, that the discovery of the cause of any complaint has always been followed by an immediate improvement in its treatment. But even in this enlightened age, when the aids to scientific investigation have become so potent, it is surprising how little is known of those things which induce sickness.

Groping in the dark, we have made some unexplained discoveries of remedies which have proved efficacious. The *rationale* of the action of most of these is still a sealed book. In what way mineral poisons act to neutralize the effect of certain animal poisons—how it is that one drug acts as a sudorific, another as an expectorant, still another as a stimulant, cathartic, or emetic—yet passes our comprehension.

In surgery there still remain some unsolved enigmas, but it is in its province much less involved in perplexities than that of its sister department of medical science.

There is, doubtless, very much in pathology that must remain mysterious, till we more nearly approach to the greatest of all mysteries—life. Biology must make enormous advances before pathology can develop into anything like the proportions which the sciences of chemistry and physics have attained. No other field of investigation is so much beset with difficulties as this. Whichever way we turn and struggle to penetrate the mists that obscure our vision, we meet with the most discouraging obstacles. Were it not that all nature groaning in travail together makes an appeal that humanity cannot resist, the investigation would long ago have been abandoned as hopeless. But by dint of the most arduous toil, and through the actual martyrdom of many who have even braved death rather than be turned back, there have been gathered together a few precious crumbs of knowledge, and from these has been created a real, though very imperfect, science of pathology.

Among the most recent, as well as the most important, contributions to this science, are the results of investigations as to the extent and variety of atmospheric influences in the production of pathological conditions.

The microscope has been the chief instrument by which these investigations have been prosecuted. It reveals to us that what appears to the unaided human eye as a clear transparent medium, is really a mingled cloud of mixed gases, watery vapor, organic germs, the dust of nearly every known solid, and even living creatures.

Every breath we draw is loaded with materials that, introduced in sufficient quantity, would cause immediate and serious embarrassment to the vital functions.

So numerous and potent are these invisible enemies, animate and inanimate, that Dr. Sutton, Assistant Physician and Lecturer on Physiology in the London Hospital, takes the ground that inherited structures and *external* conditions are the true factors of disease.

Miasms, formerly supposed to be noxious exhalations or gases, unknown to chemists, and eluding their research, are now believed to be, for the most part, extremely minute germs, that find ingress to the circulation through the lungs, and there mature and breed, and multiply till their presence makes itself felt in chills and fevers. Though it is not proved by actual observation, that the infection of smallpox, measles, scarlet fever, etc., consists in similar germs, it is extremely probable that these diseases are so propagated.

Many skin diseases are now known to be the result of the establishment of insect colonies or vegetable plantations on the fruitful soil of the animal skin. Helmholz it was, we believe, who, affected with a hay-cold or incipient catarrh, examined the nasal discharge, and found it an ocean of vibriones. Diseases of the mouth, in children, have been traced to fungoid growths, the germs of which find a *nidus* in their food. In short, in our food and drink, as well as in the air we breathe, there lurk, unseen without the aid of the microscope, the seeds of numberless ills.

And yet not one doctor (the word means teacher, and every doctor of medicine should be a teacher as well as a healer), not one in fifty owns a microscope, or could use it skillfully if he had one.

Medical students are taught anatomy, physiology, surgery, obstetrics, *materia medica*, and the theory and practice of medicine—which includes pathology—but the latter, which owes its progress more to the microscope than to any other modern scientific appliance, is taught without the use of this instrument, with the manipulation of which every student of medicine should be as familiar as with that of the scalpel. Every medical school that has not a professorship of microscopy, is behind the age.

Another instrument which has been recently employed in the study of pathology is the spectroscope. An instrument, whose power, in dealing with the minutest traces of matter, has been so fully demonstrated, will doubtless be of service in detecting peculiar abnormal conditions of the tissues and the fluids.

PREJUDICES, ANCIENT AND MODERN.

We read in the writings of one of the most genial and accomplished of modern authors, that "the world is no fool's or sluggard's paradise, but a battlefield ordained from of old." And evidently true as this is generally, and more especially and significantly in a moral sense, it is singularly applicable to the world of science. From the days of Galileo to our own times, the discoverer and successful explorer, of the region of the dim unknown which surrounds our limited yet constantly extending Cosmos of ascertained knowledge, has had not only to fight with Nature, who sometimes struggles hard to keep her secrets, but, having won access to her mysteries, to combat the prejudices, and often the ignorance of his fellow men.

The unwillingness of men to adopt a new revelation of scientific fact is found, more or less, in all societies, and is co-existent with the mental emaciation which we find everywhere, and the existence of which we recently had occasion to deplore. It is, moreover, the most lamentable characteristic of an ordinary mind, paralyzed by being used in one direction only (which our correspondent, J. C. McElroy, last week somewhat euphemistically called "specialism"), that all truth that is an advance beyond the narrow sphere of average experience, is doubted, struggled against, and denied, not because it is false, but because it is new.

This atrophy of the mind is, we are glad to think, diminishing in extent and influence. In the prodigious activity of the present day, when each field of knowledge has its myriad explorers, when even the rapidity of modern experimental science does not prevent microscopic investigation of every detail, and the whole domain is thoroughly searched for new treasures of fact, the toilers after truth have little patience with the opposition of the ignorant. And the extended and liberal education of this age, which is the greatest of the advantages that society derives from the increase of wealth, has done much to secure, for all new discoveries, a fair hearing and a candid and impartial criticism. Altogether, we Americans have little to reproach ourselves with on this ground; indeed, we have among us some who run after the new, be it true or not; and who, in their zeal for discovery, forget that scientific knowledge must grow organically, and not be created out of nothing. But certainly no truth, however at variance with the preconceived ideas of half educated men, will fail to find hearers in this country, although some of them may merely tolerate it to await the issue, as Gamaliel did in a notable instance.

It is, then, a most hopeful sign of the improved intellectual condition of this age, that the unreasoning opposition of the average mind and the "specialist" is losing strength and pertinacity. The complete man, whether he be philosopher, artist, merchant, or mechanic, will never be a "specialist," in the narrow sense of that term. He will have sympathies with and interests in all honest pursuits, and consider nothing human, and certainly no human knowledge, as alien to him. The cultivation of the mind is the first duty of every man to whom the blessing of education has been given; and a fair index to a man's want of mental capacity and discipline is afforded by the number and strength of his prejudices. And the giant strides of science, during the past few years, are not more remarkable in their effect upon the material and intellectual well-being of the world, than in the moral advantages men have gained by the cultivation of a large hearted and catholic tolerance for all diversities of opinion. And this tolerance is reasonable, and will continue to increase. It would be strange, indeed, if men who have seen the lightning chained and taught to work, and fire made an obedient and docile helpmate to man, who have learned the history of the component parts of the sun, and have seen the astronomer sweeping the heavens "to charm her secret from the latest star," were all to continue to oppose, with blind and unyielding obstinacy, the introduction of a new process or a new truth. There are still many persons constitutionally unfit for appreciating or doing justice to the talents and the toil of their fellow men, but they are fast diminishing in number; and, under Providence, it is Science, majestic, beautiful, and benign, who shall deliver the world from them and from their yoke.

FIFTY feet of the bottom of the Wyoming canal, near Wilkesbarre, sank suddenly a few days since, draining the whole level.

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ICE A NECESSITY.---HOW IT IS OBTAINED IN QUANTITY.

As a class, man is proverbially ungrateful. Those comforts which lighten his labors, day after day, he regards as matters of course, and gives not one single thought in gratitude for the enjoyment consequent upon them, nor one single reflection upon the care and labor expended in order that he may enjoy them. Little does he think, while sipping his ice water, after a day of toil under a sun high in heaven, and with the thermometer far up in the nineties, of the immense amount of labor expended a few months before in gathering and storing that substance which shall render his water palatable. Now that the hot season is once more upon us, it may not be inappropriate to give within the space of a short article, a description of the process of gathering the immense crop of ice which is necessary to supply the demands of sweltering humanity in our cities.

When we consider that seventy years ago ice in cities was deemed a rare luxury during the summer, and it was only within the power of the wealthy to pay the prices demanded,it must be conceded that the increase in its consumption and decrease in price have been wonderful, when, today, rich and poor alike demand it as one of the necessities rather than the luxuries of life. In the city of New York, seventy years ago, a few tuns satisfied the demand; for consumption during the present season, in this city alone, 1,000,000 tuns have been harvested, engaging the energies of six companies with an aggregate capital of $4,000,000; in its transportation and delivery, employing forty barges, five steamers, three hundred wagons, five hundred horses, and seven hundred men.

Many of the ice houses, in which the ice is stored until needed, are built of brick, with double, triple, or even quadruple walls, the spaces between the walls being filled with sawdust or some like substance. They are from 200 to 400 feet long and from 100 to 200 feet wide, and are sometimes three and four stories in hight. Airtight doors close each floor.

A proper time having arrived for the gathering of an ice crop, all is hurry and bustle. No time is to be lost, and here we fully comprehend the truth of the maxim that "time is money;" as the ice companies may be obliged to content themselves with but one crop of ice, everything depends upon the haste with which it is gathered, for should an unpropitious change take place in the weather, thousands of dollars' worth will be lost. All day long the men are as busy as bees, and, should the night be clear and the moon gracious, no respite is given, and the dawning of another day sees the work being carried hurriedly on. The ice field having been fenced in and the snow scraped off, the ice is planed to a depth of two or three inches to remove the porous ice coating from the solid mass beneath. A machine called a marker, drawn by horses, then cuts narrow grooves five feet apart over the whole length of the field; these are crossed by similar grooves, dividing the field into squares; these grooves are deepened and the squares made smaller by a harrow having three rows of teeth two feet apart. One row of blocks having been separated from the field by means of a hand saw, it is lifted upon the surface and hurried to the house. Rapidly a gang of men pry off the blocks with crow bars; the blocks are elevated upon an inclined plane, lowered into the house, and packed in sawdust, bran, shavings, or bark. As soon as one story is filled, the doors are closed, the next story is treated in the same manner, and so on, until the house is filled, when it is closed, not to be op ned until the ice is needed. The ice is handled as little as possible, for like riches, with much handling it may take to itself wings and fly away.

SCIENTIFIC INTELLIGENCE.

EXPLOSIVE ACTION OF OZONE.

A number of mysterious explosions of various nitrogen compounds have attracted the notice of chemists, and some experiments have been instituted with a view to an explanation of the phenomena. It has been found that nearly all of the mixtures composed of nitrogenous substances and used as explosives, are decomposed with more or less violence by ozone. A powder in which picric acid was a constituent, caused great damage in the laboratory where it was made, in consequence of the action of ozone. At first the cause of he accident was inexplicable, but careful research traced it o the ozone in the atmosphere.

Nitro-glycerin is at once decomposed by ozone into nitric acid and other compounds. Gun cotton is also destroyed, sometimes with explosive force, and so on through the list of explosive compounds. An extension of these researches may eventually afford an explanation of the spontaneous decomposition of certain bodies, and may suggest precautions to be observed to prevent a recurrence of the accidents; and it has been suggested that a new test for ozone might be found in this way.

USE OF GLYCERIN IN TESTING FOR GRAPE SUGAR.

Glycerin possesses the property, in the presence of soda or potash, of dissolving a considerable quantity of hydrated oxide of copper. On this account, the alkalies do not give a precipitate from copper solutions to which glycerin has been added. Hence the copper solutions for testing for grape sugar can be advantageously prepared with a small proportion of glycerin, as they can be rapidly made, do not easily decompose, and withstand the action of diffused light. A standard solution can be prepared as follows: Dissolve 16 grammes pure sulphate of copper (blue vitriol) in 64 grammes of water, and gradually add 80 cubic centimeters caustic soda, specific gravity 1·34 (about 112 grammes), and then add, with constant agitation, 6 to 8 grammes pure glycerin, until the liquid is clear. It would be possible to prepare a solution, in this way, of a fixed value for the quantitative determination of grape sugar, and such a method could be applied to the analysis of cane sugar by converting the latter into grape sugar, previous to making the test.

DEATH OF PROFESSOR PAYEN.

Professor Anselme Payen died recently in Paris at the advanced age of seventy six, having been born January 17, 1795. After completing his studies, he was one of the first persons to appreciate the importance of the beet sugar manufacture to the prosperity of France, and early became a director of one of the largest sugar refineries. Afterwards he assisted in the foundation of several important chemical works, until he was called to the chair of applied chemistry at the *Conservatoire des Arts et Métiers* in Paris, where he devoted the remainder of his days to instruction by lecture and laboratory practice, and where he wrote his numerous papers on applied science, and prepared his learned work on the application of chemistry to the arts. He was long an authority in all matters of the application of science to the wants of man; and his own investigations were among the best contributions the French have made to this branch of knowledge. We remember him as an urbane, kind man, always ready to lend a helping hand to those who applied to him, an admirable specimen of a scientific teacher. He remained at his post during the recent siege of his native city, and took an active part in the food discussions at the meetings of the Academy. His health was not perceptibly impaired, but the strain appears to have been too much for his overworked brain, and he died suddenly of apoplexy. His death will be severely felt at the institution where he has so long and successfully labored, and the scientific world in general will regret to lose one of its most active and useful members.

NEW TESTS FOR PETROLEUM.

Good petroleum should possess the following characteristics:

1. The color should be white or light yellow with blue reflection; clear yellow indicates imperfect purification, or adulteration with inferior oil. 2. The odor should be faint and not disagreeable. 3. The specific gravity at 60° Fah. ought not to be below 0·795 nor above 0·804. 4. When mixed with an equal volume of sulphuric acid of the density of 1·53, the color ought not to become darker, but, on the contrary, lighter. A petroleum that satisfies all of these conditions and possesses the proper flashing point may be set down as a pure and safe article.

SILVERING GLASS.

The various methods invented by Liebig, Bothe, Böttger, and others for depositing silver upon glass have been considerably modified and improved by Krippendorf, in Switzerland, and we give below a condensed statement of the latest improvements introduced by him. The following are the labels required for the materials to be used in silvering glass:

1. Seignette salts; that is, tartrate of soda and potash.
2. Solution of seignette salts in the proportion of one gramme to fifty grammes of distilled water.
3. Caustic ammonia, fifty cubic centimeters.
4. Solution of nitrate of silver, 1·8.
5. A flask of 1,000 cubic centimeters capacity for the reducing liquid.
6. A second flask of same size for the silvering solution.

With the help of the above chemicals and flasks, the two normal solutions, viz.: (1) the reducing liquid; (2) the silvering liquid can be prepared in the flasks (5 and 6).

1. The normal reducing solution: 900 cubic centimeters (grammes) distilled water are mixed with ninety cubic centimeters seignette salts solution (2) and the mixture brought to boiling over a suitable fire. During the boiling of the liquid, by which considerable steam is evolved, twenty cubic centimeters of the nitrate of silver solution are added from No. 4, by which the whole liquid is blackened. The whole is allowed to boil for ten minutes until the so called oxytartrate of silver is formed, when the reducing liquid is ready for use. This normal liquid can be preserved any length of time; in fact, it seems to improve by age. It can be kept in flasks, and when required for use must be carefully filtered. Experience has shown that it is better to prepare the normal reducing liquid in a flask rather than in a capsule.

2. The normal silvering liquid: Nitrate of silver is dissolved in water, and ammonia gradually added until the brown precipitate is nearly all dissolved, then filtered, and diluted until there is one gramme of nitrate of silver in 100 cubic centimeters of the liquid. For those who are not chemists, it is as well to take 900 cubic centimeters distilled water, add eighty cubic centimeters of the silver solution from No. 4 (1·8) and afterwards 100 drops caustic ammonia from No. 3.

3, The silvering process: Equal volumes of the liquids (1) and (2) are carefully and separately filtered and afterwards poured together into a vessel of the proper size, and the well cleaned glass plate introduced. In about ten minutes a decomposition of the mixture begins to take place, indicated by a blackening of the surface, and pure metallic silver will be deposited upon the plate. The introduction of the plate and the cleaning of it take place precisely as in photographic operations, otherwise irregular lines and unequal deposits of silver result. Gentle heat and sunlight facilitate the operation, while cold and darkness retard it. Finally the plate is removed from the vessel, rinsed with pure water, and varnished or otherwise protected by a background. Good photographic varnish can be recommended for coating the film. For bath, after the operation, contains fifty to sixty per cent of the original silver, which can be reclaimed as chloride by the addition of hydrochloric acid. Hollow ware, reagent bottles, and test tubes are silvered by simply pouring in the solutions (1) and (2) in the same way as described above. The silvering the interior of large flasks, it is well to introduce a small quantity of the liquid at first, and to turn it rapidly around until the surface is covered with a thin deposit. Treated in this way, the operation becomes a very simple one, and may lead to the introduction of silver mirrors as substitutes for quicksilver glasses for very many purposes.

The New Railroad Depot at Forty-second Street and Fourth Avenue.

Among all our large commercial buildings, the railroad depots are those of which New Yorkers have least cause to be proud. Discomfort, shabbiness, and dirt, concentrated in ill-ventilated structures, have generally hitherto been all the accommodation to the public that our railroad kings have seen fit to give. But at last a building has been erected, where space for business, order and discipline in arrangement, ample ingress and egress, and substantial elegance of interior and exterior, are provided. This is the new Union depot, corner of Forty-second street and Fourth avenue, and it is intended to be the New York terminus of the New York Central and Hudson River, the New York and Harlem, and the New York and New Haven lines, which are all, directly or indirectly, under the control of Commodore Vanderbilt.

The building is nearly 800 feet in length by 240 in width, and is thus about four acres in floor area. The crown of the arched roof is over 100 feet from the ground; and the iron and glass of which the roof is built, and which is now the universal system of roof building for railroad purposes, inure to the depot plenty of light and an airy and pleasant appearance. Offices for the transaction of the business of the three roads, well built and decorated, are exterior to the depot itself, and face Forty-second and the adjacent streets; and waiting rooms, with restaurant adjoining, and toilet accommodation are also provided.

Telegraphic communication is made from the depot master's office to all the switches, and the centralization of all the switch arrangements will be found to prevent the numerous slight accidents which often occur in and about a railroad depot, accidents of which the public hears nothing, but which add greatly to the expenses of a railroad. To these well designed and costly arrangements, it will be necessary to add a well disciplined, courteous, and business like staff of clerks, porters, and attendants; and the traveling public will appreciate the convenience of the new terminus, and one of our railway presidents will have got rid, as far as he is concerned, of a lasting reproach to New York.

Munroe's Refrigerator.

In this refrigerator, a box or outer casing, made of wood and of any convenient or required form, size, and proportion, contains a porous vessel, either made in a single piece or in slabs or pieces of any material (preferably of kaolin), but of any mineral or other substance which possesses the required degree of porosity. The outer surface of this porous vessel or evaporating medium is corrugated, to present a more extended evaporating surface, or it may be made with double walls or projecting wings, or in any form for the same purpose. It has a channel or gutter around the top, either continuous or in sections, into which water or other liquid is placed. This liquid is absorbed by the porous vessel, so that the latter becomes saturated with the moisture. Any water or liquid which may drip from the vessel or evaporating medium is caught by a hopper shaped false bottom and conducted into a watertight drawer, whence it may be discharged at pleasure through a faucet. The vessel or absorbing and evaporating medium is supported above the drip bottom in any suitable and substantial manner, any device being employed which will not obstruct the current or currents of air from passing up or down entirely through the refrigerator. Between the casing and the evaporating medium is an open space on each side, which open space extends from the top entirely through, and in the top are orifices for the admission or discharge of air. In practice the air current is downward, and the more rapid the evaporation of the liquid or moisture, the stronger will be the current of air. The evaporating vessel is lined on the outside with zinc or other metal, but preferably with some mineral composition, cement, or plastic material, either waterproof in itself or used in combination with a waterproof coating on the vessel, so that moisture shall be entirely excluded from the preserving chamber. By this means the use of ice is dispensed with The temperature in the preserving chamber is, the inventor claims, readily reduced to 40° in the hottest weather. In fact the temperature is more readily reduced in hot than in moderate weather, as the evaporation will then be more abundant. The improvement applies not only to refrigerators for family use, but to refrigerating compartments on board of vessels or on railroad cars for the transportation of meats, fruits, and vegetables. The motion of such vessels or cars will produce currents of air, which might be conducted to the absorbing and evaporating medium, and utilized in maintaining a low temperature in a preserving chamber. Lateral as well as vertical currents may be employed, and the air may be forced in contact with the evaporating medium by a blower or otherwise, as may be found most convenient, or as circumstances may dictate. This apparatus is the invention of Charles E. Munroe, of Cambridge, Mass.

GLUE KETTLES.—A few holes, bored in a glue kettle, in a horizontal line near the rim, will allow steam from the boiler to enter the kettle, and so prevent the glue from solidifying on the side. The holes need not be bored all round the kettle, as it is handy to be able to pour glue out of one side without wasting it.

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What an Editor should Eat.

It is often said that editors are born, not made. This, says the *American Newspaper Reporter*, is doubtless true, as it is of many other occupations in life. Yet we have abundant evidence to show that men born with great capacity for certain occupations are frequently beaten in the race by men of much lower caliber. It is clear that to be born for a position is by no means all that is necessary to enable one to fill it satisfactorily.

In the editorial profession many of the most noticeable failures have been the result of bad habits—mental, moral, or physical. Publishers will almost always prefer the even good sense and correct habits of average capacity to the fitful brilliancy of a born editor, whose habits are constantly stealing away his efficiency. To be a thorough editor, however, in all things, is a high ambition, and given first the mental capacity at birth, adding a thorough education and good habits, and everything worth having will be his. The question of food has assumed a large importance in the scientific world, and few things have so great a power over intellectual usefulness as what we eat and drink. An organism which is expected to be always clear, reliable, and ready, requires careful treatment to insure its usefulness. In all questions of stimulus an ambitious editor will always be a radical. No reliance can be placed in any stimulant whatever. It betrays when least expected to do so, and often destroys in a moment all that the labor of months, or even years, had accomplished. "I have never trusted," says Parton, "to a single sentence written under the influence of a stimulant." And it is well known that none of our journalists who have a reputation for long continued or arduous literary labor, ever depend upon stimulants in order to accomplish it.

After abstinence from stimulus, and a habit of perfect regularity in all things, the food question becomes of the highest importance. It is well known that certain kinds of food are peculiarly fitted for keeping the brain in a state of healthy activity. Many literary men here and in Europe permit themselves coffee, tea, and condiments in moderation, and for the rest confine themselves almost entirely to fish, fruit, vegetables, milk, and the various kinds of farinaceous food, Graham bread and oat meal taking the lead. These articles have, by repeated experiments, been found to be the best for brain workers. Some constitutions, however, seem to thrive best on a strictly vegetable diet.

Miles Grant, editor of the *World's Crisis*, has done a vast amount of intellectual labor; yet, after being eighteen years a vegetarian, he finds himself in the most perfect mental and physical health. The articles chosen are those preferred in the highest scientific circles, though, as we have indicated, few consider coffee and animal food, in strict moderation, injurious. The bread adopted by Mr. Grant, and which he says, with reason, will enable one to labor longer, and with less fatigue than any other one substance, is made with coarse Graham flour, mixed with water and baked in an oven. Oatmeal, in its various forms, is next on the list, and beans (boiled without meat) and baked apples are next in order. Two meals a day are found to be better than three, and they should be taken, Mr. Grant thinks, wholly without condiment, though equally high authority says that a sufficiency of condiment should be used to render the food palatable. A window in the sleeping room should be left open, feather beds avoided, and the hours kept as regularly as possible.

These seem simple directions, but Mr. Grant affirms that it is through these means that he has been enabled to fulfil his editing duties with comfort, and to preach, when necessary, fifteen sermons per week.

How to discover Sewage Contamination in Water.

Now that the warm summer months are approaching, the quality of the water used for drinking purposes becomes a matter of anxiety to the thoughtful householder. This is particularly the case in country districts, where the supply of water is obtained from wells, and may be affected by unsuspected sources of contamination. In the spring, therefore, every householder should call in the powers of the analyst, in order to demonstrate the purity or approaching foulness of his water supply; and this even though the water be clear, bright, and tasteless.

The reason an apparently pure sample of water should be analyzed is simply this: A water may contain so small an amount of sewage, that micro chemistry will alone reveal its presence; and waters which contain such small quantities of sewage may remain innocuous through the winter, and only develop their ill effects on the approach of warm weather, and then suddenly.

The possibility of approaching danger having been indicated by the analyst, it may often be turned aside by a little attention to surface drainage, which is most commonly the source of contamination. Surely it is worth while to spend a guinea or two in order to prevent a pestilence whose cure may cost many times the sum.

The trouble involved in getting the matter into the right hands need not be great, as your chemist and druggist will almost certainly know of a suitable analyst, and will probably negotiate the matter. The samples for analysis should be collected in half gallon bottles, which have been properly cleaned and have well fitting glass stoppers; one such bottle will suffice for an ordinary analysis. Here again your chemist will help you, and provide a bottle ready for filling. In drawing the water, say from a well, the pump should be worked for a few minutes before filling the bottle, so that the sample sent may be unquestionably free from casual impurity.

It may interest general readers if we point out the chief features of the chemical evidence on which the analyst bases his judgment of a sample of water. We find, in the pages of a cotemporary, an account of the methods employed, from the pen of Mr. S. W. Rich. In the ordinary examination of a sample of water used for domestic purposes, two points have to be investigated: First, the freedom of the water from sewage contamination; secondly, the character of the water from a soap consuming point of view. The first point is determined by a series of micro-chemical processes, which indicate the presence of the elements of sewage in their characteristic form, and more particularly of "ammoniacal" and "albuminoid" organic matter. We may explain that these terms are applied to organic matter in a more or less advanced state of decomposition, from which ammonia is liberated, under specified conditions, and that the quantity of ammonia thus obtained commonly serves as a direct measure of the amount of sewage contamination. Collateral evidence has to be considered. The second point is determined by a direct estimation of hardness, and is interesting from an economico-domestic point of view. It is also customary to examine samples of water for lead, as this poisonous metal is frequently present where it is least suspected.

Druggist's Apparatus for Dividing Powders.

George P. Allen, of Woodbury, Conn., has invented an apparatus for proportioning and dividing powders, being intended to provide a simple and efficient means whereby druggists may quickly separate a mass of powder into any given number of equal quantities for doses, instead of the slow and inaccurate method of dividing with the spatula now employed. The invention consists of a board or plate of any kind or substance best suited for the purpose, having any required number of holes or pockets of uniform size and shape made through or in it, and each hole provided with a movable bottom or piston arranged for shifting quickly to vary the depth of the pocket, all the said bottoms or pistons being arranged so as to move equally in relation to the plate or holes therein. In using this instrument the mass of powder is placed on the table and scraped over the holes so as to fill as many as the number of divisions required. If it fails to fill as many holes as the said divisions require, the pistons are raised or the plate lowered, as the case may be, by which the powder in the filled pockets will be raised above the surface, so that some of it may be scraped into the holes not filled, which being done, and the requisite number of holes filled, the division is completed. The pistons are then raised to the level with the table and the powder raised up in separate piles, to be scraped away separately. The pistons are shifted downwards, and the operation of dividing the powders is carried on in like manner, if the pistons are too high at first.

Improved Show Case.

This show case is designed for showing and exposing for sale kid gloves, hosiery, laces, parasols, handkerchiefs, silks, ribbons, and any other merchandise that it may be designed to show in cases. It consists of one or more glass covered compartments so arranged that the back compartments are more fully presented to the view of the customer, enabling the merchant to exhibit a greater quantity and variety of goods in a given space without increasing the hight of the case. The cases may be used in a vertical position, or formed into an entire counter. If more than one case is used in a counter, the compartments are placed in an angular position. Where the cases are made as represented, eighteen sample dozen handkerchiefs, representing a stock of large amount, can be shown in a case three feet by two, thus bringing a great variety before the eye of the customer, while they are all at the same time under the eye of the seller, and, after the sale is made, can be put in order and re-arranged in a short space of time. With show cases of this description, where merchandise of the descriptions named is on sale, it is claimed that at least one third of the usual number of clerks now needed may be dispensed with. George A. Hearn, Jr., of New York city, is the inventor.

School Seat.

Mr. David I. Stagg, of New York city, has invented a new school seat, which is claimed to be a simple, strong, durable, neat, and convenient folding chair, so constructed as to allow the pupils to pass in and out freely and economize space. A pedestal is secured to the floor in the ordinary manner. To the upper end of the pedestal is secured a cross piece which equals in length the breadth of the chair, to the ends of which are securely attached end frames to which the back is attached, and to which the seat is pivoted. The end frames, back, and seat are constructed in the ordinary manner, except that the end frames do not extend below the top of the pedestal. This construction enables a folding school seat or chair to be attached to and supported by a single pedestal or column, so as to obtain, at the same time, the advantages of a folding seat and single column support.

Raising a Sunken Ironclad.

Efforts now making to raise the monitor *Weehawken*, sunk in Charleston harbor during the late civil war, reveal the facts that she lies due east and west on a bottom of mud, and there is about eight feet of water over her at low tide. In this position she is a dangerous obstruction in the channel. All her machinery has been taken up, and likewise the iron of her turret and deck. Her interior is all filled with mud and garbage, among which human bones are here and there visible. The diver is able to see about him when the water is clear. When the water is not clear he is compelled to go entirely by feeling, and in the muddy water, it is said, he sees better by night than by day, owing to the presence of innumerable phosphorescent animalculæ. Over two hundred tuns of iron and various metals have been raised from this ship.

Resignation of the Hon. Horace Capron.

We are to lose the valuable services of the Hon. Horace Capron, as Commissioner of Agriculture. The peculiar fitness of this gentleman for the office which he has so long and so worthily held, has been made familiar to our readers by quotations, from his elaborate reports, which have appeared from time to time in our journal.

Mr. Capron proceeds to Japan, on a mission undertaken at the solicitation of the Japanese Government, to introduce American systems of, and appliances for, agriculture, engineering, railroading, and industrial pursuits generally. The expedition will be aided by a corps of scientific men, and the best possible results from it may be looked for.

Mr. Capron's resignation takes effect on 1st next August.

EDITORIAL SUMMARY.

THE following illustration, says Professor Henry, of the vibratory movement of matter is attested by Professor Horsford, of the United States. The top of the high tower which constitutes the Bunker Hill monument inclines towards the west in the morning and the north at mid-day, and towards the east in the afternoon. These movements are due to the expanding influence of the sun as it warms, in succession, the different sides of the structure. A similar but more marked effect is produced on the dome of the capitol at Washington, as indicated by the apparent motion of the bob of a long plumb line fastened to the under side of the roof of the rotunda, and extending to the pavement beneath. This bob describes daily an ellipsoidal curve, of which the longer diameter is 4 inches or 5 inches in length. By molecular actions of this kind, Time, the slow but sure destroyer, levels to the ground the loftiest monuments of human pride.

IN a recent number of Poggendorff's *Annalen*, Dr. Wein hold states that the black absorption line of sodium can be easily obtained by a simple process. The usual method has been to interpose a flame, colored with chloride of sodium, between a strong light, such as the electric light, and the slit of a spectroscope. The source of light now proposed by M. Weinhold is an ordinary petroleum lamp; the light is allowed to pass through a slit directly on to a prism, and a spirit lamp flame, intensely colored with chloride of sodium, interposed between the prism and the eye, so as to cover the entire spectrum; the black absorption line will then be seen distinctly. If the flame colored with sodium be placed in front of the slit, the bright yellow line will be seen as usual. M. Weinhold has not been successful in using this method with an ordinary spectroscope fitted with telescopes, on account of various practical difficulties.

FORTIETH INDUSTRIAL EXHIBITION OF THE AMERICAN INSTITUTE.—The American Institute will hold its Fortieth Exhibition of National Industries during the coming autumn in the great structure known as the Empire Rink, covering the block between Second and Third Avenues, and Sixty-third and Sixty-fourth streets, opening, August 15th, for the reception of heavy machinery; Monday, August 28th, for reception of goods; Thursday, Sept. 7th, at 12 M., to the public, with an opening address; remaining open every secular day from 9 A. M. to 10 P. M., until and including Saturday, Nov. 4th, when it will close with an address and the proclamation of awards.

CRAMP in horses arises from irregular action of the motor nerves. Rubbing the affected parts with a wisp of hay for ten minutes would be beneficial; and should friction alone not remove the tendency to cramp, the parts affected should be rubbed occasionally with a solution of camphor and olive oil, in the proportion of one part of camphor to four of olive oil.

CEMENT FOR METAL AND GLASS.—The following cement will firmly attach any metallic substance to glass or porcelain: Mix two ounces of a thick solution of glue with one ounce of linseed oil varnish, or three fourths of an ounce of Venice turpentine; boil them together, stirring them until they mix as thoroughly as possible. The pieces cemented should be tied together for two or three days.

THE fifty per cent of silica in the straw and grain, respectively, show why it is that oats flourish luxuriantly on meadow land that has been broken up from grass. It also indicates that potash, for the reduction of the silicates, is absolutely essential as a constituent of the soil. Wood ashes, therefore, are very serviceable in the growth of the crop, as well as in the production of the finer grasses.

THE improved foot lathes made at Laconia, N. H., have obtained quite a notoriety. One was taken with Hall's Arctic Expedition which left this port lately. We learn that they are being sent in all directions—to California, Canada, Cuba, and Europe; many of them to noted places, such as the U. S. Military Academy, West Point, N. Y., Brown's University, Providence, R. I., etc.

AN exhibition illustrating the progress of all kinds of industrial pursuits is announced to be held at Moscow, Russia, next year, being the two hundredth anniversary of Peter the Great. The naval branch of the exhibition will have a most attractive curiosity, a boat built by the great Emperor, who "served his time" as a ship carpenter at Woolwich, England.

A SINGULAR accident happened to a lady in Portland, Me., not long ago. She went to call on a friend, and when she pulled the door bell, the wire broke, and she fell backward, striking her head on the steps. She was rendered insensible and very severely hurt.

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The Electro-deposition of Tin.

The *English Mechanic* says: An improved process for coating articles, made of certain metals, with tin, by means of electricity, has been recently patented in England.

The inventor (Mr. J. E. Bingham) claims that he can coat and preserve iron, steel, brass, copper, nickel, lead, zinc, gold, platinum, and any of their alloys, or the alloys of manganese; and states that his improved method is specially applicable to the prevention of oxidization or tarnishing of silver surfaces exposed to atmospheric influences.

The inventor, in carrying out his improvements in the electro-deposition of tin, takes a given quantity of that metal, by preference in a pure state, although what is commercially known and sold as tin may be employed, which he dissolves in chlorhydric acid, and precipitates by means of a solution of crude potassic hydrate; the precipitated tin is then washed free from acid, after which a quantity of potassic hydrate and also of cyanide of potassium is added; the temperature is raised to a point just below that at which the solution boils; and when it has been thus heated, a quantity of solution of calcic hydrate is added.

In the solution thus obtained, sheets of tin and the articles to be coated with the same are suspended; the articles having been prepared in the usual manner. The tin and the articles to be coated are then connected with the battery in the usual manner, and the articles are retained a longer or shorter time in the solution according to the quantity or thickness of tin required to be deposited on their surface.

The quantity of ingredients may be varied, but the inventor uses with advantage a bath of the following composition: To ten gallons of water eight hundred and twenty-six grains of tin in solution, two and a half pounds of potassic hydrate, half a pound of cyanide of potassium, and one hundred grains of calcic hydrate are added. These proportions constantly vary according to the heat of the solution, the state of the electric current, and the quantity of metal dissolved and deposited. Thus a variation in the quantities of the several ingredients, will be caused, which can only be determined and altered by a practical operator, in accordance with the requirements of his solution.

In the event of the equilibrium of the solution not being maintained in so far as regards the heat, quantity of metal, electricity, or chemicals employed, the deposit obtained is liable to become rough, in which event the article should be taken out and brushed with wire brushes (as is usual in the manufacture of electro-plated articles) and again passed into the solution; and also in the case of large articles, the granular, soft, or surplus deposit must be removed by an ordinary brush, a cloth and sand, or by any other convenient method.

The solution may be made from several precipitates of tin, provided that potassic hydrate, cyanide of potassium, and calcic hydrate are added, and a similar result may be obtained by dissolving the tin into the solution by the aid of electricity.

THE Broom (*Sarothamnus scoparius*) is extremely abundant in Madeira, but is supposed to have been originally introduced to the island. It is now sown extensively on the mountains for the purpose of being cut down for firing, or burnt on the spot every five to seven years to fertilize the ground. The twigs and more slender branches are also used commonly as withs for binding bundles of faggots, brushwood, fern, etc.; and numbers of country people, especially young girls and children, residing within reach of Funchal, gain a livelihood by bringing daily into the town bundles of broom for use in heating ovens, etc. The fine and delicate basket-work peculiar to Madeira is manufactured from the slender peeled twigs of this plant. Mr. Lowe speaks of a variety with pure white flowers, which occurs on this island.

A LONG STRETCH OF WIRE.—The American Compound Telegraph Wire Company have just completed, for the Pacific and Atlantic Telegraph Company, a wire for crossing the Mississippi river at St. Louis, which requires a stretch of about a mile and a half in one piece. This wire weighs 220 pounds to the mile, and by actual test the breaking strain is 1,240 pounds, which is very much more than sufficient to guarantee it against fracture after suspension, either from its own weight or by any other means.

VAGARIES OF TYPOGRAPHY.—It is hardly necessary to notify our general readers that an egregious blunder was perpetrated in our last issue, by which the cut of "Baxter's Steam Engine" was inserted with the advertisement of the "Roper Caloric Engine," and *vice versâ*. The only apology we can make is to place each cut in its proper place in this present issue, and notify all our readers that "Baxter" is "Baxter," and "Roper" is "Roper."

Inventions Patented in England by Americans.

June 13 and 14, 1871.

[Compiled from the Commissioners of Patents' Journal.

CONSTRUCTION OF SHIPS.—W. G. Warden, Philadelphia, Pa.

GANG PLOW.—L. Chapman, Collinsville, Conn.

GOVERNOR FOR STEAM ENGINE.—H. B. Weaver, Hartford, Conn.

MOLD FOR GLASS BLOWING.—S. R. Bowie, New Bedford, Mass.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars, with full information on foreign patents, furnished free.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

SCIENTIFIC AMERICAN.—Back Numbers, Volumes, and Sets, for sale at low prices. Theo. Tusch, 37 Park Row, New York.

Water Engines.—Manufacturers will please send price lists and circulars to John Osborn, Engineer Fair Haven Water Co., New Haven, Ct.

Fine Engravings, more of them and better than ever before, will be given in every number of the present volume of the RAILROAD GAZETTE.

The "Union Water Meter Co.," Worcester, Mass., manufacture Steam-pressure Regulators, the best machine in use for reducing and regulating the pressure on paper machines, bleacheries, slashers, and all places where an even temperature is desired.

We pay more for Brass Turnings, Brass, Copper, Lead, Zinc, Pewter, than any other establishment. Consignments, large or small, wanted, from all parts of the country. DuPlaine & Reeves, Philadelphia.

Line, Shafting, Pulleys, and Hangers.
First class. Send for circulars and price lists. Greenleaf Machine Works, Indianapolis, Ind.

For Centrifugal Pumps, address Morris, Alvord & Co., 70 Canal street, Syracuse, N.Y.

Wanted.—The address of manufacturers of Wire Fences, Driven and Bored Well Machinery, etc. J. M. Ferguson, Summit, Miss.

Steel and Brass Letter Cutter. John C. Hilton, Chicago, Ill.

Magic Lanterns and Stereopticons, of every description. Send for Catalogue. W. Mitchell McAlister, 728 Chestnut st., Philadelphia.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and reset by J. Dickinson, 64 Nassau st., New York.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Boilers.—Allen's patent will prevent scale from forming, and not injure the iron. In 3 gallon cans, price $6. J. J. Allen, Philadelphia.

J. A. Whitman's Water Wheel Governor beats them all for bis. and price. Auburn, Me.

Electrical Instruments, Models, etc., made to order, and Gear Wheels and Pinions cut, by W. Hochhausen, 113 Nassau st., Room 10, N.Y.

Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth st., Brooklyn, manufacture Presses and Dies. Send for Catalogue.

Bright and industrious American, Scotch, English, German, or French boys, of 16 years or older, who desire to learn the machinist trade, in a first class establishment, will please address, for terms, P. O. Box 685, Hartford, Conn.

The Bucket-Plunger Steam Pump discharges at both strokes, with only two water valves. Valley Machine Co., Easthampton, Mass.

Lord's Boiler Powder is only 15 cts. per pound by the bbl., and guaranteed to remove any scale that forms in steam boilers. Our Circular, with terms and references, will satisfy all. Geo. W. Lord, 107 W. Girard ave., Philadelphia, Pa.

Improved mode of Graining Wood, pat. July 5,' 70, by J. J. Callow, Cleveland, O. See illustrated S. A., Dec. 17,'70. Send stamp for circular.

Ford's Portable Tobacco Press for Planters. Will sell Virginia, Maryland, Missouri. Address Ford's Tobacco Warehouse, Evansville, Ind.

Air Cylinder Graining Machine.—A perfect tool for House Painters and Manufacturers of all kinds of Decorated Ware. Complete Machine for $50.00. Send stamp for Circular. The Heath & Smith Manufacturing Co., 44 Murray street New York.

For the most perfect Band Instruments in the world, send to Isaac Fiske, Worcester, Mass. Illustrated Catalogues free on application.

The Patent for the best Hydrant, or Fire Plug ever invented, for sale. For descriptions, terms, etc., address Lock Box 356, Lockport, N.Y.

Best Scales.—Fair Prices. Jones, Binghamton, N.Y.

Steam Watch Case Manufactory, J. C. Dueber, Cincinnati, Ohio. Every style of case on hand, and made to special order.

L. & J. W. Feuchtwanger, Chemists, 55 Cedar st., New York, manufacturers of Silicates of Soda and Potash, and Soluble Glass.

For Hydraulic Jacks, Punches, or Presses, write for circular to E. Lyon, 470 Grand st., New York.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

Send your address to Howard & Co., No. 865 Broadway, New York, and by return mail you will receive their Descriptive Price List of Waltham Watches. All prices reduced since February 1st.

Ashcroft's Low Water Detector, $15; thousands in use; can be applied for less than $1. Names of corporations having thirty in use can be given. Send or circular. E. H. Ashcroft, Boston, Mass.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, each capable of pressing 35 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N.Y.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

Cold Rolled-Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year.

A Practical Chemist, educated in Germany, desires a situation in a manufacturing laboratory or technical school. Address J. S., Peekskill, N.Y.

If Every Man
Who spends money in advertising would go or send to Geo. P. Rowell & Co., the New York Agents for most of the newspapers published in the United States, the number of successful advertisers would be largely increased.

Examples for the Ladies.

Mrs. E. B. Dodge, Little Rock, Ark., has used her Wheeler & Wilson Machine 14 years, doing the family sewing for 9 children (6 of them daughters), working with scarcely a day's intermission, alike satisfactorily upon the finest silks, cambric, and the coarsest soldier's clothing, without any repair. She has used the same needle—a No. 2—for more than three years, lowering it as it wears off.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

THE USE OF APERIENTS.—I am every year more dissatisfied with mankind; they want to know everything except what concerns them most. Just think of F. C. asking the question, in the SCIENTIFIC AMERICAN of June 24, "whether the habitual use of aperients is injurious." This is one of the wide roads to the grave. Let F. C., if he be one of those victims, gradually learn to do without aperients, and increase the quantity of his food, *sans increase of nourishment*, as much as he can. Volumes could be written in explanation, but I only lay down the principle. If F. C. keeps the principle always in view as long as he may live, he will thank the writer of this letter, before he is five years older.—J. M.

BELTS.—It is asked by one of your querists, "Why a belt will run to the largest part of a pulley?" If a ribbon be drawn tighter on one edge than the other, it will bow out, or become crowning on the tight edge, more particularly at the point taken hold of. It is the same with a belt. The large part of the pulley draws the belt tighter than the small part, and consequently changes its direction, at the point of its entering on the pulley.—S. G. D., of Pa.

DISSOLVING MICA.—In the column of queries, page 347, Vol. XXIV., M. asks if he can dissolve mica. He can do what will perhaps answer his purpose equally well. Grind mica fine, and mix to a proper consistency, with a solution of gum arabic, in water. It is sometimes used in this form as a substitute for silver ink.—J. E. W., of N.H.

CISTERN.—If E. E. H. will take the pains he will always have good cistern water. Let him construct the cistern so it will hold water to the top if necessary; cover it so no sweepings or washings can enter, and provide for good ventilation. If a pump be used, he should run the suction pipe no nearer the bottom than 18 inches. He must keep the gutters clear of leaves, otherwise he will have a filter of rotten leaves instead of charcoal. He should make the connection from the gutter to the cistern so it can be detached, and never allow the water to enter until the house roof and gutters are completely washed off by the rain. This rule I follow strictly, and clean out the cistern once a year. I always have good cistern water.—J. A. Mc., Ind.

POWER TO DRIVE CIRCULAR SAWS.—If E. A. M. wishes to know which of the two circular saws takes the least power, I will say the thin saw always; but the same saw will not be suitable for all kinds of work. The saw with sixty teeth will answer well for some work, but the saw with thirty teeth would not. Practice will soon tell him which is best. —J. A. Mc., Ind.

CASING OF STEAM PIPE.—B. L. C., who wants information as to casing a steam pipe, ought to be surprised if he ever works anything but warm water into his engine. Such an elaborate device for condensing his steam as a pipe 180 feet long, uncovered with any non-conducting material, is seldom seen. He will find that a covering of felt, or of the numerous boiler cements now made, will produce an immediate and great effect. But he should at once, if possible, place his boiler and his engine in close proximity, and then use all possible means to prevent the radiation of heat. He will not, then, be forced to diminish the pressure in his cylinder by keeping his cylinder cocks open.—D. B., of N. Y.

TO RESTORE BURNT CAST STEEL.—In your paper of June 17, A. T. L. asks for a recipe to restore burnt cast steel. Take 1½ pounds borax, ½ pound sal ammonica, ¼ pound prussiate of potash, 1 ounce rosin. Pound the above fine, add a gill each of water and alcohol. Put in an iron kettle, and boil until it becomes a paste. Do not boil too long, or it will become hard on cooling.—F. A. K., of Pa.

TELESCOPE.—In reply to E. T., I would say that the directions I gave were for a terrestrial telescope, which answers equally well for an astronomical one.

J. R., of N. J.—The pressure of steam in a boiler is exerted in all directions. The pressure of the water is transmitted in only one direction—downward. The pressure upward on the inner side of the top of the shell is that due to the expansive force of the steam. The pressure downward on the inner side of the bottom of the shell will be that due to the expansive force of the steam plus the weight of the water and the steam. The weight of the water and the steam is, however, received by the exterior supports upon which the boiler rests, so that practically there is on this account, very little if any more liability of the breaking of the shell at the bottom than at the top.

C. E. M.—The rule for finding the area of a circle, *i. e.*, multiplying the circumference by one fourth the diameter, depends for its approximation to exactness upon the exactness with which the circumference has been determined. As this is only attained approximately, of course the rule in question, although practically exact enough for all purposes, is theoretically imperfect. The problem of "squaring the circle" requires that the theoretically exact area shall be found.

A. E. S., of Mo.—In the oxychloride of zinc paint, the proportion of oxide of zinc used may be varied. It should, however, not be less than half the weight of the chloride. The object of the tartrate of potassa is to prevent too rapid drying. This may, therefore, be used in variable proportions. The amount of water and starch used depends upon the consistency required. Experience can be the only sure guide in these particulars. By a few preliminary experiments with small quantities you will probably be able to succeed.

S. —., of ——.—"Let well enough alone." If the iron pipe used does not rust, why should you wish a galvanized pipe? We have often expressed our disapproval of zinc coated iron pipes to convey water for culinary purposes. We believe them pernicious. We do not think burning an iron pipe in a wood fire would keep it from rusting in contact with water that would rust ordinary iron pipes.

A. G. X., of Ohio.—Glycerine and litharge stirred to a paste, hardens rapidly, and makes a suitable cement for iron upon iron, for two stone surfaces, and especially for fastening iron to stone. The cement is insoluble, and is not attacked by strong acids.

C. E. A., of R. I.—In your attempts to make a solution for electro-plating without a battery, you failed, probably through not using sufficient hyposulphite of soda. The recipe distinctly says, "a slight excess of the salt must be added."

C. B. P., of N. Y.—You can procure Haserick's "Secrets of Dyeing," of E. C. Haserick, Laconia, N.H.

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Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1. -PRINTER'S COMPOSITION.—I should be glad if some of your readers would give me a recipe for a real good printer's roller composition, tough, serviceable, and one that will distribute all kinds of ink.—R. W.

2.—CLOTH DAMAGED BY MOLD.—Please inform me what will restore cloth affected by mold?—J. A.

3.—MILLSTONE PICKS.—Will some practical mechanic give me a recipe for tempering mill picks, for stones that are hard? Something that will not make the picks too hard, but will toughen the steel and keep a sharp edge.—F. A. K.

4.—GUN BARRELS.—I would like to know how laminated steel barrels and Damascus steel barrels are made, and which are the most durable for fowling pieces?—J. M.

5.—FISH CHANGING THEIR COLORS.—I wish to know the cause of the change of color in fish, as follows: I have an aquarium made of galvanized cast iron, in which the water is constantly changing. I have thirteen fish, gold, silver, bullheads, one shiner, and four roaches, or as some call them "pumpkin seeds" or "sun fish" or "kivers." Two of these roaches change from a very pale yellow to a very deep blue black three or four times a day, the change occupying from three to seven minutes. They remain of this deep blue black color for about thirty minutes, when they change back again to their natural color as quickly as they changed from it. While they are of this unusual color, the other two roach chase them about the tank, and have bitten their fins and tails till they are very ragged; but while of their natural color, they appear to live in great harmony. I have one and a half inches of sand on the bottom, and feed the fish once every two days with worms. Only these two particular fish change their color, although I got the four at the same time, from the same pond, some three or four months ago. They were caught with a hook, but have always been healthy. An explanation would oblige—S. M., Jr.

6.—VARNISH.—I need a pale, hard, glossy, quick drying varnish, for use on white and colored labels. Can any of your readers give me a recipe for such a varnish, which will dry in a few hours, and which will not turn yellow or dark by age?—B. F. B.

7.—A STEAM ENGINE PROBLEM.—Suppose the exhaust of a steam engine, after passing through a surface condenser, be connected directly with the boiler, below the water line, as feed water, would the engine work? It is the opinion of an eminent engineer that if everything were properly adjusted that it would.—J. C.

8.—LUBRICATING OIL.—Can any of your readers tell me which kind of oil is best for lubricating? The sugar centrifugals in our refinery, running at very high speed, appear to gum all oils used on them, especially where the spindle rests on the step of the centrifugal machine. We have tried all oils that we know of, but with little relief.—S. R.

9.—LESSENING THE STRENGTH OF PAPER.—Could one of your many thousand readers give me the much desired information, whether there is any acid, fluid, or other substance that I can put on paper to make it tear easily, and only tear where I put it? I do not want it to destroy the paper, but only to make it weaker where this fluid, acid, or whatever it may be, is put on.—C. C.

10.—PRIMING OF BOILER.—Will some intelligent reader of the SCIENTIFIC AMERICAN tell us why our boiler primes or foams so much? This occurs from once in four days to two or three times a day. We blow off once or twice a day. The water is taken by a well 22 feet deep, from a vein running through sand rock. Our boiler is 14 feet long, 40 inches diameter, with thirty-two 3½ inch tubes, and a dome 14 inches by 2 feet high, and steam pipe 2¼ by 12 feet long. The cylinder is 10 by 30 inches, and the engine runs 90 to 100 revolutions per minute. Very good draft, and dome in center of boiler.—J. & I. T.

11.—MERCURY AS A PROPELLER.—I noticed in a recent issue of the SCIENTIFIC AMERICAN, in an article relating to the means used for the propulsion of canal boats, that mercury had been used as an agent to produce propulsion. I wish to ask some reader of your valuable paper in what way and manner it was employed.—F. S.

12.—WALNUT STAINS.—Can any reader of the SCIENTIFIC AMERICAN inform me if there is anything that will remove the stains of black walnut from the hands without making the skin rough or hard?—W. H. B.

13.—TWISTING OF ROPE FALL.—How can I take the twists out of a fall? I have a double block and a single block with a manilla rope three fourths of an inch in diameter. Is there any way to keep it from twisting?—C. A. B.

14.—WATERPROOFING FRESCO PAINTING.—How are water colors made waterproof by fresco painters?—P. E. S.

15.—SPECIFIC GRAVITY OF HYDROGEN.—I wish to know, from some of your readers, how many cubic feet of hydrogen gas would raise 140 pounds off the earth and balance it in the air.—S. F.

16.—SOLDERING COPPER.—I use, in soft soldering copper, muriate of zinc, which oxidizes the copper so that, when it is painted with oil paint, the paint does not dry in spots where the copper has been oxidized by the acid. What will neutralize this effect, or what kind of solution (or anything else) can be applied to the copper that the paint will dry over, and at the same time be durable?—F. E. H.

17.—MOISTURE IN THE AIR.—Can some one describe any economic method or methods whereby the moisture contained in the atmosphere may be extracted? Also, the percentage of moisture absorbed by such method from air saturated at the ordinary temperature, say 62° Fah.?—J. H.

18.—VICE BOX.—How can I fasten threads in a vice box?—B. R.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

FENCE.—John A. Kysor, Leon, N. Y.—This invention has for its object to furnish an improved portable fence, simple, cheap, substantial, and reliable, and which may be easily and quickly taken down, moved to another place and again put up. It consists in the arrangement of legs or braces and hooks with the ends of panels, which are formed by attaching horizontal bars to cross bars. The adjacent ends of the panels overlap each other and are held in place at their top by inclined braces, and at their bottoms by hooks. The braces also serve as legs to support the panels away from the ground.

HAY ELEVATOR.—Charles E. Gladding, of Towanda, Pa.—This consists of a novel combination of a traveller, with a beam therefor, a pulley, and a tripping device. The arrangement is peculiar, yet, though difficult to describe in brief, not complicated. We judge it will be able to compete with other devices of similar character in market.

REAMER.—John K. Derby, of Jamestown, N.Y., assignor to Daniel A. Seymour and Elias B. Stillson, of same place, is the inventor of this implement. It is adjustable for different sized holes. The cutting device is novel, as, in fact, is the entire tool, no less than four different claims being allowed. We have no doubt this will be found a useful tool.

GANG PLOW.—This is a new combination of the elements of a gang plow which is simple, convenient, and effective. It consists of an arrangement of a frame, truck wheels, and various other parts, which, as they cannot well be described without engravings, need not be enumerated. The plow is one which will, we think, rank among the first class of its competitors. Michael Sikes, Mansfield, Ohio, is the inventor.

SEED PLANTER.—This is the invention of William Knowland and Kearnes Collings, of Henryville, Ind. It consists of a novel combination of mechanism for the planting of seeds in drills. The seeds are placed in a hopper, and conveyed by a number of conduits into furrows made by furrow openers. There are two plows for each conduit, respectively placed on the right and left, which throw up a ridge in which the seed is deposited. The seed conduit then opens a furrow in the crown of this ridge, and deposits the seed. A scraper follows, which closes the furrow. The whole is supported on wheels, which, through suitable mechanism, impart motion to the moving parts.

PORTABLE POWER PRESS.—In this invention the power is applied through a sweep to a vertical windlass, or capstan, the latter being provided with a sleeve, upon which the chains that draw the follower are wound. The sleeve is held from slipping on the shaft by a pin, which, when the bale is compressed, is withdrawn, and the sleeve then turns freely, so that the follower is readily placed in the proper position to receive a new bale. With the vertical windlass is also combined a crane for hoisting the bale out of the press. Thomas B. Wait, of Zena, Oregon, is the inventor.

WHIFFLETREE COUPLING.—Hyde Crocker, Jr., Montrose, Pa.—This invention consists of a strong cast metal plate, with a large central hole, the wall of which has an annular recess at the lower side, which plate is attached to one of the pieces to be coupled, and holds in said recess the flange of another plate, fitted into the large hole and attached to the other piece, the whole forming a cheap and simple coupling, which may be quickly bolted or riveted to the parts.

INSTRUMENT FOR RINGING HOGS, INSERTING RINGS IN LEATHER, ETC.—John Heesen, George Heesen, and Henry Nyland, Tecumseh, Mich.—This invention consists in the means for applying sheet metal rings to hogs' noses. Instead of sheet metal, wire may be used, with the ends sharpened; but the sheet metal, or flat ring, is preferred. When the piece is placed within the jaws of the instrument, the nose of the hog is caught between the jaws, and a single gripe forces the sharp ends or points of the metal through the skin, completing the ring and securely fastening it in the nose. It may be applied to inserting rings in leather or cloth. The inventors, therefore, claim it for all the purposes for which it may be adapted.

DUMPING CAR.—The object of this invention is to provide a railroad car with a jointed top or platform, which can be raised in the middle and lowered at the sides, to form inclined planes, from which its load will be spontaneously discharged. The labor of unloading sand and ballast from the cars is thus avoided, and the process carried out much more rapidly than by manual labor. The invention consists in making the car platform of two longitudinal sections, which are hinged together, so that they can be raised in the middle to discharge whatever has been placed upon them; and, also, in the use of new mechanism for raising or lowering the middle part of the platform by means of the rolling gear of the car. Jacob C. Wiswell, of Lennoxville, Canada, and Frederick A. Wiswell, of Beebe Plain, Vt., are the inventors.

PRESSER FEET FOR SEWING MACHINES.—James Wensley, of Philadelphia, Pa.—The object of this invention is to provide the presser foot of a sewing machine with a stitch guide, whereby, especially in leather, sewing or stitching can be done exactly parallel with seams. From the under side of the presser foot projects a feather, or rib, which is sufficiently thin to enter a seam, and thereby guide the fabric to let the stitching be parallel to the seam. The feather is secured to a spring, which is fastened to the shank of the presser foot by a screw or rivet, the feather projecting through an orifice in the presser foot. The spring can be set to regulate the depth of the feather. A point, or pin, projecting from the end of the presser foot, serves as an eye guide for the operator, it being in line with the feather and above the seam.

VAPOR BURNER.—George H. Wilson, of Mansfield, Ohio.—This invention consists in the arrangement of heating and conducting tubes for heating the oil and air, a flame regulator, and a disintegrator for the oil, whereby the inventor claims to have produced a burner superior to those hitherto used for burning the vapors of hydrocarbons. The disintegrator consists in a quantity of sand confined between two diaphragms of perforated substance, or gauze wire, which, besides serving to prevent the too rapid flow of vapor or oil, or the escape of the oil before vaporizing, also serves to facilitate the vaporizing of the particles.

COOKING STOVE.—Henry T. Holmes and Wallace H. Priest, of Little Falls, N. Y.—This invention consists in a new way of arranging the fire pot and air chamber of a cook stove with relation to each other. Two fire pots are used, and it is claimed that by the arrangement of these pots in the chamber, and the method of admitting the cold air thereto, much of the heat radiated by them may be saved; and that, by the employment of two fire pots, a considerable economy of fuel will result, when only one pot is to be heated; and the heat will be concentrated on the pot, instead of the cross bar, which is very soon ruined in the stoves of ordinary construction, being exposed to the most intense part of the fire, and the heat of which, passing through the plate, is lost, as far as the application of the vessels is concerned. The heating chamber, in which the fire pots are placed, is also of peculiar construction, and forms a part of the claim.

FLESH FORK.—This improvement consists in the mode of attaching the two outer tines to the shank of the fork. Three tines are used, the middle tine being an elongation of the shank of the handle. The two outer tines are made of a single piece, which passes through the shank, the ends being properly tapered and bent to correspond in form with the tine. As heretofore made, a round hole has been punched through the shank, and the piece forming the two outer tines is made to fit, being simply a piece of round iron or steel, of the required size, tapered and bent as before stated. The forks are made of iron or steel, or of both, and are tinned over to prevent oxidation. This thin coating of tin is all the fastening which the round iron has in the shank, or all that is depended upon to prevent the iron from turning in the hole. In lifting with the fork, the tendency is to loosen this connection, as the strain at times is great, and the result is that after using such forks, and while the outer tines drop down, by reason of the loosened shank connection, the fork becomes worthless. To remedy this, the inventor makes a square or other shaped hole through the shank, and makes the piece which forms the two outer tines to fit it. He also enlarges the shank around the hole to give additional strength where the strain is greatest. By this improved mode of manufacture the fork is claimed to be made strong and durable, and suited for army and navy as well as for household use.—Paul Fisher, of Brooklyn, N. Y., is the inventor.

RAILROAD CAR VENTILATOR.—This invention provides among other things for the adjustment of car windows, so that they may be partially swung open to allow the outflow of the heated air, and at the same time present an oblique position to the direction in which the train is advancing. Provision is made for admission of fresh air, from the advance of the train, and allowing the air exhausting from the car to pass out at the side windows, which, being arranged as described, are particularly favorable for use in this way, as the cinders cannot possibly enter the openings on account of being thrown off by the oblique windows. The oblique windows also facilitate the exhaust by creating a partial vacuum behind them and at the openings to be supplied by the air from the tube at the top of the car which admits the fresh air. The employment of three-bladed valves in openings in the upper part of the car also constitutes a part of the claim. Nathaniel Jones, of Buffalo, N. Y., is the inventor.

SHUTTLE FOR SEWING MACHINE.—George H. Lenher, of Elizabeth, N. J.—This invention is intended to supply an improved method of attaching bobbins to the shuttles of sewing machines, more particularly to a shuttle patented by the same inventor, Nov. 27, 1866. The attachment is now made by means of a screw-threaded stud-pin, which is fixed to the bottom of the recess that carries the bobbin. A nut is applied to the eye of the bobbin, so made that it will turn freely, but cannot escape therefrom so as to be lost and give trouble.

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116,531.—DRYER.—H. W. Adams, Phiiadelphia, Pa., and S T. Bacon, Boston, Mass.
116,532.—DRYER.—H. W. Adams, Philadelphia, Pa., and S. T. Bacon, Boston, Mass.
116,533.—BLACKING.—R. W. Bailey, New York city.
116,534.—JACK.—H. Ballentine, Philadelphia, Pa.
116,535.—FEATHER RENOVATOR.—C. E. Barber, W. Dean Central Village, Conn.
116,536.—TRIMMING.—J. Bauer, Newark, N. J.
116,537.—DERRICK.—W. Q. Baxter, Maple Township, Pa.
116,538.—GAGE.—T. Beach, Freeport, Pa.
116,539.—SAWING MACHINE.—H. Bean, Fredonia, Ohio.
116,540.—BUGGY TOP.—B. L. Benson, Fairview, Ind.
116,541.—DIE.—G. W. Billings, Chicago, Ill.
116,542.—PITMAN ROD.—E. S. Blake, Pittsburgh, Pa.
116,543.—CARVING MACHINE.—M. T. Boult, Battle Creek, Mich.
116,544.—PADLOCK.—D. T. Brown, Plainfield, N. J.
116,545.—TOOL SUPPORTER.—I. F. Brown, New London, Ct.
116,546.—CLEANING FIBER.—J. Brown, Bay Ridge, N. Y.
116,547.—BOLT CUTTER.—J. R. Brown, Cambridgeport, Mass.
116,548.—CAPSTAN.—J. S. Brown, Schenectady, N. Y.
116,549.—GRAIN SEPARATOR.—J. D. Brunner, Doylestown, Pa
116,550.—REGISTER.—H. C. Buhoup, Pittsburgh, Pa.
116,551.—SPELTER.—J. E. Burrows, Newark, N. J.
116,552.—PLANTER.—S. J. Bye, Bluff Point, Ind.
116,553.—NAIL HAMMER.—H. Cheny, Little Falls, N. Y.
116,554.—WHEAT CLEANER.—E. Chipman, Baltimore, Md.
116,555.—WINDMILL.—E. Cleaver, North Wales, Pa.
116,556.—COTTON PLANTER.—J. P. Clopton, Terry, Tenn.
116,557.—SPRING.—Z. Cobb, Chicago, Ill.
116,558.—IRON SMELTING.—C. Cochrane, Upper Gornal, Eng.
116,559.—FIREARM.—F. G. Cochran, St. Louis, Mo.
116,560.—SWING.—G. W. Cole, Canton, Ill.
116,561.—POOL BALL RACK.—H. W. Collender, New York city.
116,562.—VOLTAIC PLASTER.—W. C. Collins, Bucksport, Me.
116,563.—CARBURETER.—M. P. Coons, Brooklyn, N. Y.
116,564.—SHOW CASE.—W. Cooper, Jr., Mexico, N. Y.
116,565.—TAMPING APPARATUS.—D. Corgan, Sugar Notch, Pa.
116,566.—COUPLING.—G. E. Darling, M. Heus, Marytown, Wis.
116,567.—ADDRESSING MACHINE.—G. A. Davison, Montana, Iowa.
116,568.—TOY ENGINE.—A. L. Dewey, Westfield, Mass.
116,569.—SAWMILL.—A. M. Dexter, Mattapoisett, Mass.
116,570.—BINDING ATTACHMENT.—G. E. Dolton, Monee, Ill.
116,571.—ROCKING CHAIR.—J. W. H. Doubler, Darlington, Wis.
116,572.—PUMPING ENGINE.—P. Doyle, New Comerstown, Ohio.
116,573.—VAPOR BURNER.—M. B. Dyott, Philadelphia, Pa.
116,574.—MOP HOLDER.—D. Edward, Montreal, Canada.
116,575.—ICE CREEPER.—E. S. Ellis, Trenton, N. J.
116,576.—WATER METER.—G. D. Emerson, Calumet, Mich.
116,577.—LEAF HOLDER.—A. Extein, J. C. Mills, Springfield, Mss.
116,578.—PREPARING FURS.—L. Falkenau, San Francisco, Cal.
116,579.—NICKEL PLATING.—M. G. Farmer, Salem, Mass.
116,580.—FUNNEL.—R. T. Fisher, G. F. Waldron, Boston, Mass.
116,581.—LOCK.—J. Fisler, G. Crompton, Jersey City, N. J.
116,582.—ENGINE.—R. N. and R. Francis, Girard, Pa.
116,583.—CANAL LOCK.—J. W. Gentry, and G. W. Barcus, Peytona, W. Va.
116,584.—FREEZER.—C. Gooch, Cincinnati, Ohio.
116,585.—CORSET.—C. A. Griswold, Willimantic, Conn.
116,586.—UMBRELLA.—G. G. Griswold, Brooklyn, N. Y.
116,587.—BRICK MACHINE.—F. L. Hall, Oneida, N. Y.
116,588.—HARVESTER.—W. H. Harman, Westminster, Md.
116,589.—SUPPORT.—D. Hartmann, Mansfield, Ohio.
116,590.—SEAT.—F. M. Hawkins, Indianapolis, Ind.
116,591.—CHUCK.—H. H. Heskett, Le Roy, Ill.
116,592.—WHEEL.—B. B. and J. R. Hill, Worcester, Mass.
116,593.—FIREARM.—F. W. Hood, Boston, Mass.
116,594.—NEEDLE.—O. L. Hopson, Waterbury, and H. P Brooks, Wolcottville, Conn.
116,595.—CAR COUPLING.—H. R. Howe, Hartwick, N. Y.
116,596.—GOVERNOR.—R. K. Huntoon, Boston, Mass.
116,597.—STARCH.—C. B. Hutchins, Ann Arbor, Mich.
116,598.—FURNACE.—R. Jenkins, Newark, Ohio.
116,599.—SYRINGE.—W. J. Johnson, Newton, Mass.
116,600.—CORN POPPER.—W. J. Johnson, Newton, Mass.
116,601.—HARVESTER.—D. A. Kellogg, Valparaiso, Ind.
116,602.—SASH.—J. N. Kikendall, Jr., Virginia, Ill.
116,603.—CRUTCH.—S. Kreger, Philadelphia, Pa.
116,604.—DESULPHURIZING ORE.—G. T. Lewis, Phila., Pa.
116,605.—NOZZLE.—J. Lewis, Chicago, Ill.
116,606.—CLOTHES DRYER.—C. F. Linscott, Chicago, Ill.
116,607.—HOIST.—W. M. Lloyd, New York city.
116,608.—HEATER.—W. H. Lungren, Baltimore, Md.
116,609.—SHUTTLE.—J. Lyall, New York city.
116,610.—STEAM PLOW.—M. N. Lynn, New Albany, Ind.
116,611.—WATER GAGE.—M. N. Lynn, New Albany, Ind.
116,612.—DRILL.—R. Marks, A. C. Behne, Connersville, Ind.
116,613.—PULLEY BLOCK.—R. Marsden, Sheffield, England.
116,614.—WASHING MACHINE.—M. S. Marshall, Somerville, Ms.
116,615.—COTTON GIN.—R. W. Massey, Macon, Ga.
116,616.—GRIPER.—V. E. Mauger, New York city.
116,617.—MOVEMENT.—J. H. McCamey, Wytheville, Va.
116,618.—CLUTCH.—E. McDonald, Boston, N. H. Cole, Swampscott, Mass.
116,619.—VALVE.—Edward McSteen, Pittsburgh, Pa.
116,620.—HEATER.—N. Middleton, S. Morris, Philadelphia, Pa.
116,621.—DOOR FASTENER.—J. A. Morris, Greenbush, N. Y.
116,622.—HAY ELEVATOR.—W. T. Neil, Greensborough, Pa.
116,623.—FRAMING JOINT.—J. Newton, New York city.
116,624.—CURTAIN FIXTURE.—J. Norman, New York city.
116,625.—SAW MILL.—S. M. Palmer, Glen's Falls, N. Y.
116,626.—TANNER'S STEEPER.—L. K. Parsons, C. E. Getchell S. W. Fairfield, Salem, Mass.

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116,627.—CORN SHELLER.—A. H. Patch, Hamilton, Mass.
116,628.—SASH HOLDER.—A.W. Pennington, Rochester, N.Y.
116,629.—CHAIR.—C.R.Peters,W. P.Taylor,San Francisco,Cal.
116,630.—SETTING BOILERS.—O. Ranney, Corry, Pa.
116,631.—BINNACLE.—G.W. Richey,H.E. Bixby, St.Louis, Mo.
116,632.—LINE SUPPORTER.—T. Riley, Williamsburg, N.Y.
116,633.—SEED PLANTER.—B. Saunders, Claverack, N.Y.
116,634.—SATCHEL.—M. Schwerin, Newark, N. J.
116,635.—KNIFE CLEANER.—J. Seeberger, West Troy, N.Y.
116,636.—OIL TANK HEAD.—George Selden, Erie, Pa.
116,637.—SHINGLE MACHINE.—C. Shelmidine, Summit, N.Y.
116,638.—PRESERVING WOOD, ETC.—J. E. Siebel, Chicago, Ill.
116,639.—CLOTHES DRYER.—D.C.Smart,Cambridgeport, Mass.
116,640.—SHOT CARTRIDGE.—C. E. Sneider, Baltimore, Md.
116,641.—CART BODY FASTENING.-E.Spa ding,Plainfield,N.H.
116,642.—FIREARM.—G. R. Stetson, New Haven, Conn.
116,643.—DRAIN PIPE.—J. W. Stockwell, Portland, Me.
116,644.—DOOR SPRING.—M. F. Taber, Salem, Ohio.
116,645.—SEWER TRAP.—S. Towle, New York city.
116,646.—STOVE DOOR.—J. Van, Cincinnati, Ohio.
116,647.—DRAWING PATTERNS. O. B. Vandenberg, Findlay,O.
116,648—ROLLER SKATE.—G. Vincent, Stockton, Cal.
116,649.—LATHE CHUCK.—A. H. Wagner, Prairie City, Ill.
116,650.—BALING PRESS.—I. P. Walker, Milwaukee, Wis.
116,651.—CEMENT.—I. Waterman, London, Canada.
116,652.—INSECT TRAP.—L. I. Way, Annawan, Ill.
116,653.—SHOE FASTENING.—E. Webb, Norfolk. Va.
116,654.—DOOR STOP.—I. J. Wells, Willmar, Minn.
116,655.—VALVE.—G. Westinghouse, Jr., Pittsburgh, Pa.
116,656.—HOIST.—W. C. Williamson, Philadelphia, Pa.
116,657.—FENCE.—T. C. Wood, Augusta, Mich.
116,658.—NICKEL PLATING.—I. Adams, Jr., Boston, Mass.
116,659.—FIRE ESCAPE.—E. Ale, Clearfield, Pa.
116,660.—GAS LIGHTING.—A. N. Allen. R. H. Dewey, Pittsfield, Mass.
116,661.—BAG HOLDER.—I. Allen, Manchester, N. Y.
116,662.—PAINT MILL.—W. R. Axe, Rockton, Ill.
116,663.—CAR COUPLING.—D. H. Ball, Sinnamahoning, Pa.
116,664.—BICARBONATE OF SODA.—W. H. Balmain,St.Helen's, England.
116,665.—CLOTHES WRINGER. E.G.W.Bartlett,Providence,R.I.
116,666.—THILL COUPLING.—A. Bedford, Cold Water, Mich.
116,667.—BAGGAGE CHECK.—F. X. Bellerive, Plattsburg,N.Y
116,668.—DRAIN TILE.—H. Bissell, Hartford, Conn.
116,669.—STEAM GAGE.—R. C. Blake, Cincinnati, Ohio.
116,670.—STAVE JOINTER.—S. C. Blinn, Tecumseh, Mich.
116,671.—STEAM PACKING.—A. O. Bourn, Providence, R. I.
116,672.—PEGGING SHOES.—D. Bowker, Boston, Mass
116,673.—TRACK CLEARER.—M. C. Boyer, Norristown, Pa.
116,674.—HEATING STOVE.--N. A. Boynton, New York city.
116,675.—DAMPER.—N. A. Boynton, New York city.
116,676.—FOLDING CHAIR.—C. Brada, New York city.
116,677.—STOP MOTION.—H. C. Bradford, R. I.
116,678.—CORN PLANTER.—E. Braggins, Mount Vernon,Ohio.
116,679.—WINDOW BLIND.—W. E. Brock, New York city.
116,680.—HEATER.—J. H. Burtis, Brooklyn, N. Y.
116,681.—COOKING RANGE.—J. H. Burtis, Brooklyn, N. Y.
116,682.—WAGON.—V. M. Chafee, Clay City, Ill.
116,683.—ANIMAL POKE.—H. F. Chapin, Rochester, N. Y.
116,684.—PACKAGE.—J. L. Cone, Waterloo, N. Y.
116,685.—BOLT.—S. Corsett, O. D. Lowe, Middleville, Mich.
116,686.—SAFE DOOR.—D'E. S. Covert, Chicago, Ill.
116,687.—SHIRT BOSOM.—C. Crowell, Syracuse, N. Y.
116,688.—SAFE DOOR.—D'E. S. Covert, Chicago, Ill.
116,689.—CHAIR.—G. Csapp, New York city.
116,690.—ROLLER SKATE.—G. S. Curtis, Chicago, Ill.
116,691.—WHEAT.—I. T. Curtis, J. W. Smith, Rochester,N.Y.
116,692.—BUTTERIS.—S. Davis, New Trenton, Ind.
116,693.—BOILER TILE.—W. Dillon, Wheeling, W. Va.
116,694.—COTTON PICKER.—B. J. Dreeson, Schleswig, Germany, and J. L. Buskett, St. Louis, Mo.
116,695.—ELECTRIC MACHINE.—L. Drescher, New York city.
116,696.—CAR COUPLING.—H. W. Earl, Baltimore, Md.
116,697.—KNOB LATCH.—H. H. Elwell, South Norwalk, Ct.
116,698.—FURNACE.—W. Ferrie, Monkland, Eng.
116,699.—COAL SCUTTLE.—Bridget Fielding, Cincinnati, O.
116,700.—BEE HOUSE.—M. A. Glass, Independence, Iowa.
116,701.—FURNACE.—B. Gommenginger, Rochester, N.Y.
116,702.—AXLE BOX.—A. Goodyear, 2d, Hamden, Conn.
116,703.—PUMP.—D. J. Gorton, Quincy, Ill.
116,704.—LUBRICATOR.—H. Grogan, Flatbush, N.Y.
116,705.—CARRIAGE SPRING.—E. Hall, Oxford, N.Y.
116,706.—SASH HOLDER.—H. R. Halsey, La Fayette, Ill.
116,707.—VALVE.—R. W. Hamilton, Hartford, Conn.
116,708.—FLOWER BRACKET.—W. Hichborn,Charlestown,Ms.
116,709.—PRESSING MACHINE.—E.S.Holloway,Columbiana,O.
116,710.—HAT.—C. A. Hopkins, C. H. Reid, G. N. Raymond, J. S. Meeker, Danbury. Conn.
116,711.—LIQUID EVAPORATOR.—J. Howarth, Salem, Mass.
116,712.—BED BOTTOM.—W. C. Hubbard, Hubbardston, Mich.
116,713.—LEAD PENCIL.—P. Hufeland, New York city.
116,714.—SASH FRAME.—J. L. Jackson, New York city.
116,715.—SEWING MACHINE.—W. Johnson, Haverhill, Mass.
116,716.—HARROW.—B. Johnston, Sterling, Ill.
116,717.—GRIST MILL.—C. Kaestner, Chicago, Ill.
116,718.—FRUIT GATHERER.—J. C. Kearns, Lewistown, Pa.
116,719.—GRAIN DRILL.—B. Kuhns, Dayton, O.
116,720.—COLORED PRINT.—M. Laemmel, Bay Ridge, N.Y.
116,721.—CAR AXLE BOX.—J. J. Lahaye, Reading, Pa.
116,722.—CASTER.—C. H. Latham, J. S. Lugg, Lowell, Mass.
116,723.—FURNACE.—J. A. Lawson, Troy, N. Y.
116,724.—FURNACE.—J. A. Lawson, Troy, N. Y.
116,725.—HAME.—G. J. Letchworth, Auburn, N. Y.
116,726.—PUNCHING MACHINE.—G.W. Lewis, Danville, N.Y.
116,727.—STEAM BOILER.—W. A. Lighthall, New York city.
116,728 —CONDENSER.—W. A. Lighthall, New York city.
116,729.—DRYING FRUIT.—J. Lowe, Guilford county, N.C.
116,730.—PISTON FACING MACHINE.—W. W. Lowerree, G. A. Sanderson, Albany, N.Y.
116,731.—HAIR CURLER.—I. S. Marcy, Nashua, N. H.
116,732.—PENCIL SHARPENER.—J. McClure, Nashua, N. H.
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116,734.—PAVEMENT.—E. McMullen, Montreal, Canada.
116,735.—HARVESTER.—J. I. Mettler, Mendota, Ill.
116,736.—WEEDING TOOL.—P. Michael, Frostburg, Md.
116,737.—LOCK.—D. K. Miller, Reading, Pa.
116,738.—CAR COUPLING.—T. Morgan, Marquette, Mich.
116,739.—GRIDDLE LIFTER.—M. D. Murphy, Watkins, N.Y.
116,740.—RAILWAY.—J. B. Newbrough, New York city.
116,741.—COTTON PLANTER AND CHOPPER.A.R.Nixon,Polo,Ill.
116,742.—BOTTLE FASTENER.—G. Otto, G. W. Bauer, Washington, D.C.
116,743.—MOUSE TRAP.—Amos Ovaitt, Unionville, Conn.
116,744.—BOOT WELT.—H. F. Packard, N. Bridgewater, Mass.
116,745.—TRANSMITTING MOTION.P.Palmlund,Brooklyn,N.Y.
116,746.—SLEEPING CAR.—F. W. Parsons, Cleveland, O.
116,747.—NAIL MACHINE.—A.W. Paull, J. Morgan, Jr.,Wheeling, W. Va.
116,748.—SOD CUTTER.—J. Pool, Rio Vista, Cal.
116,749.—WATER WHEEL.—E. Poole, Gouverneur, N. Y.
116,750.—BOOT CRIMPER.—E. Powell, New London, Ind.
116,751.—STEAM PUMP.—W. E. Prall, Washington, D. C.
116,752.—TENDER.—W. E. Prall. Washington, D. C.
116,753.—BOILER.—W. M. Pryor, R. Ludwick, Kellogg, Iowa.
116,754.—GATE.—R. Ramsey, New Wilmington, Pa.
116,755.—FENCE.—J. W. Rappleye, Farmer Village, N. Y.
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REISSUES.

4,451.—Division A.—DECORTICATOR.—W. Ager, Washington, D.C.—Patent No. 92,556, dated July 13, 1869; reissue No. 3,788 dated January 11, 1870.
4,452.—Division B.—DECORTICATOR.—W. Ager, Washington, D.C.—Patent No. 92,556, dated July 13, 1869; reissue No. 3,789, dated January 11, 1870.
4,453.—CAPSTAN.—D. N. B. Coffin, Jr., Newtown Centre, Mass. —Patent No. 98,032, dated December 21, 1869.
4,454.—EDGE PLANE.—I. A. Dunham, North Bridgewater, Mass.—Patent No. 18,237, dated Sept. 22, 1857.
4,455.—DRAWERS.—H. G. Fisk, T. R. Clark, T. J. Flagg, New York city.—Patent No. 73,975, dated Feb. 4, 1868.
4,456.—ARTIFICIAL STONE.—G. A. Frear, Chicago, Ill.—Pat- No. 73,965, dated Feb. 4, 1868.
4,457.—MANUFACTURE OF GAS.—F. King, Richmond, Va.—Patent No. 74,230, dated Feb. 11, 1868.
4,458.—PRESSING CIGARS.—A. Pearl, New York city.—Patent No. 108,290; dated Oct. 11, 1870.
4,459.—HOLDING BRISTLES.—C. D. Rogers, Utica, N.Y., M. P. Wilkins, Jersey City, N. J.—Patent No. 70,270, dated October 29, 1867.
4,460.—FRUIT JAR.—H. E. Shaffer, Rochester, N. Y.—Patent No. 96,490, dated Nov. 2, 1869.
4,461.—HOE.—E. Warren, Ceresco, Mich.—Patent No. 102,891, dated May 10, 1870.
4,462.—Division A.—PAINTING WIRE CLOTH.—C. H. Waters, Groton, Mass.—Patent No. 84,520, dated Dec. 1, 1868.
8,463.—Division B.—PAINTING WIRE CLOTH. —C. H. Waters, Groton, Mass.—Patent No. 84,520, dated Dec. 1, 1868.

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EXTENSIONS.

WHIFFLETREE HOOK.—Ann M. Cooley, Ceresco, Mich.—Letters Patent No. 17,668, dated June 30, 1857.
IRON TRUSS FRAME.—F. C. Lowthorp, Trenton, N. J.—Letters Patent No. 17,684, dated June 30, 1857.

APPLICATIONS FOR EXTENSION OF PATENTS.

GANG PLOWS.—George W. Hildreth, Lockport, N.Y., has petitioned for an extension of the above patent. Day of hearing, September 27, 1871.

MACHINE FOR CUTTING BUNGS.—Josiah Kirby, Cincinnati, Ohio, has petitioned for an extension of the above patent. Day of hearing, September 13, 1871.

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Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven yea s of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the nventor, the assignees uuder the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

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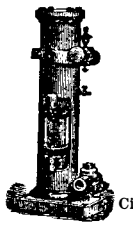

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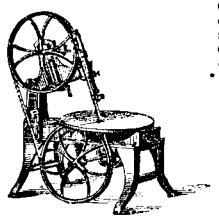

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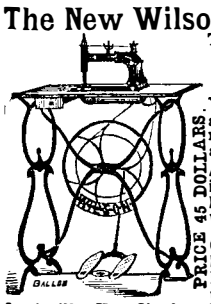

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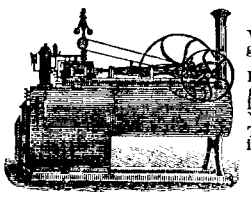

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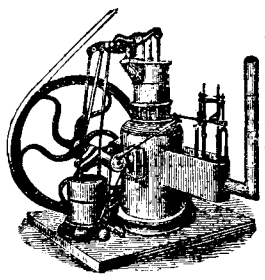

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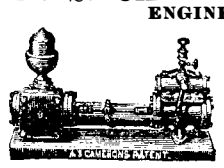

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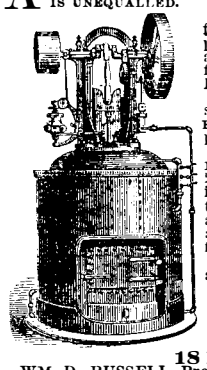

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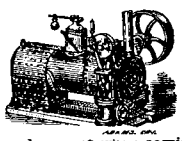

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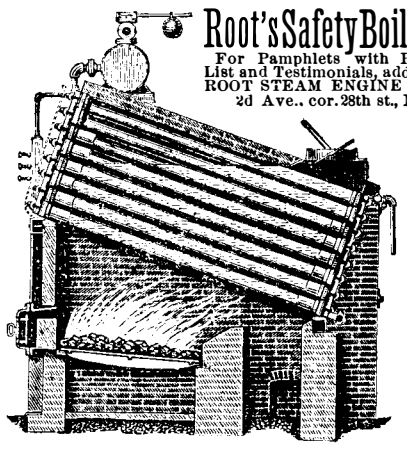

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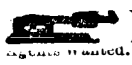

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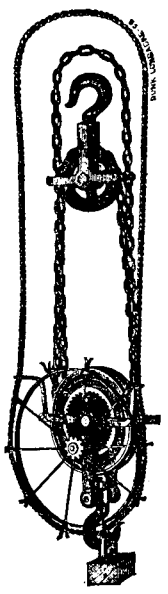

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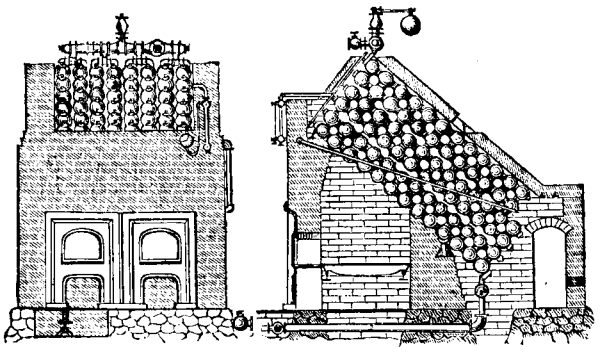

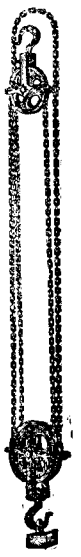

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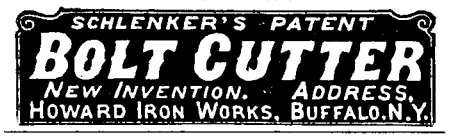

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